

ROADS AND STREETS

HIGHWAYS BRIDGES
AIRFIELDS
HEAVY CONSTRUCTION

JANUARY 1951



ALLIS-CHALMERS mounts truck wheel assembly
of new HD-15 tractor on Timken bearings. A total
of 54 Timken bearings are used in the HD-15, as
follows: bevel gear and clutch shaft, final drive pinion
shaft, final drive intermediate shaft, final drive sprocket
sprocket shaft, track idlers, track support rollers,
track wheels, power take-off pinion shaft, power take-
off gear shaft. The Gar Wood scraper shown above
is also Timken bearing equipped.

**New tractor packs more
punch for its size...
with help of 54 TIMKEN® bearings**

BIG news for tractor users is this Allis-Chalmers HD-15 tractor, shown above loading a Gar Wood scraper. New from the ground up, it provides more weight and power than previously considered standard for its class.

To insure smooth, dependable operation with minimum maintenance, under the toughest loads, Allis-Chalmers mounts vital parts of the HD-15 on Timken tapered roller bearings. A total of 54 Timken bearings are used.

Timken bearings prevent wear on moving parts by holding gears and shafts in proper alignment. They take both radial and thrust loads in any combination, eliminating the need for special thrust bearings and making possible a more simplified, rugged design. Because of the line contact between Timken bearing rollers and races, Timken bearings provide extra load capacity—carry the heaviest loads safely. And Timken bearings permit the use of tighter closures which retain lubricant, keep dirt out.

The rolls and races of Timken bearings are made of Timken fine alloy steel, case-hardened to give a hard, wear-resistant surface and a tough, shock-resistant inner core. Normally, Timken bearings last the life of the machine in which they are used.

The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



TIMKEN
TRADE MADE BEARINGS U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

SIX LAPLANT-CHOATE MOTOR SCRAPERS

complete a 60 day schedule

IN 39 DAYS!



"On the Malton Airport job in Toronto, we had 60 days to move 426,000 cu. yds. of dirt. Our six LPC Motor Scrapers finished the job in 39 days! We're buying three additional units to help us move dirt faster on future big jobs."

ELGIN ARMSTRONG
Armstrong Bros. Construction
Brampton, Ontario

ON Toronto's Malton Airport project, the six LaPlant-Choate Motor Scrapers owned by Armstrong Bros. Construction *cut schedule time by one third!*

The job called for moving 325,000 cu. yds. of heavy clay over a 1000-ft. one-way haul, and approximately 100,000 cu. yds. over a 4200-ft. one-way haul. On the 1000-ft. haul each Motor Scraper averaged 15 loads per hour with an average pay load of 14 cu. yds. On the 4200-ft. haul each unit averaged 7.9 loads per hour with an average 13.5 cu. yd. pay load. These fast 4 and 7.5 minute cycles are typical of the big production features of the fast-stepping, power-packed LPC Motor Scraper.

Your LPC distributor can show you Motor Scrapers at work. When you call him, ask him to tell you about the new, larger engines—either the Buda 280 h.p. or Cummins 275 h.p. Diesel, that give you more *usable* power and speed for schedule-trimming production. LaPlant-Choate Manufacturing Company, Inc., Cedar Rapids, Iowa—LaPlant-Choate Sales and Service, 1022 77th Ave., Oakland, Calif.

LAPLANT CHOATE



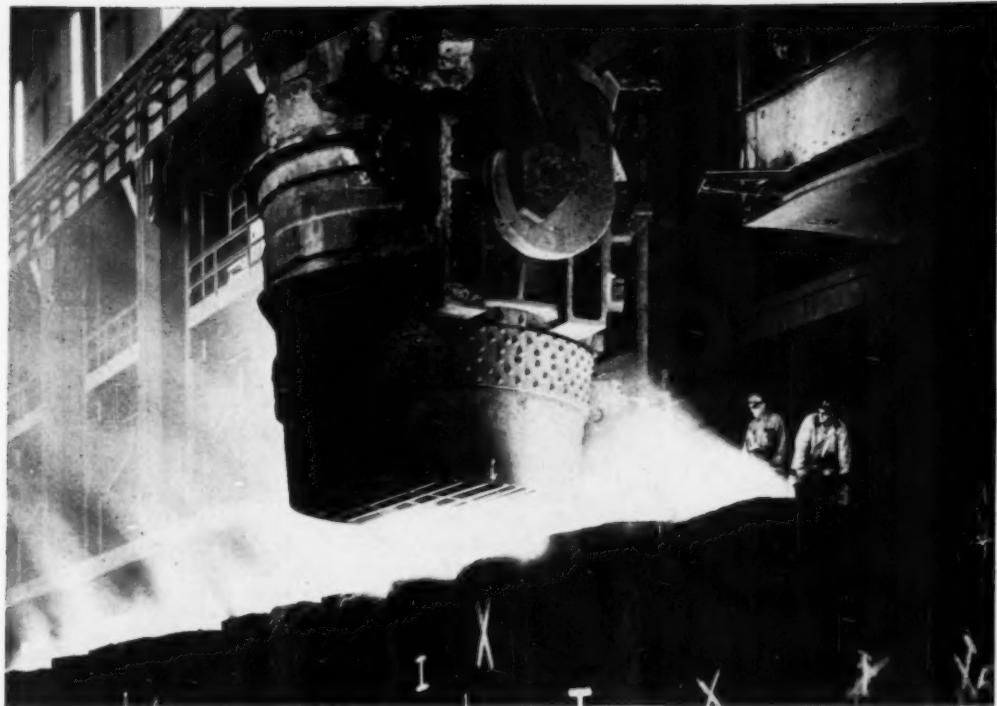
Cable-operated Scrapers in 6-, 8- and 14-yd. sizes for all makes of track-type tractors.



2- and 4-yd. Scrapers for truck-type and rubber-tired industrial tractors.



Hydraulic and Cable-operated Dozers.



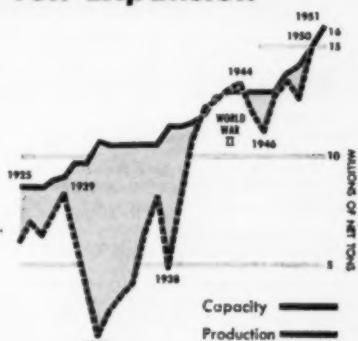
MILLION TONS MORE STEEL

**Latest Increase in Bethlehem's Annual Capacity Climaxes
5 Years of Postwar 3,100,000-Ton Expansion**

On January 1 of this year Bethlehem's steel making capacity stood at 16 million ingot-tons annually—an increase of 1 million tons over a year ago.

Since the war ended we have increased our annual steelmaking capacity 3,100,000 tons, or 24 per cent.

Moreover, as the chart at the right shows, Bethlehem's steel capacity has nearly doubled in 25 years. Additional capacity can and will be created as it is needed.



BETHLEHEM STEEL *



ROADS AND STREETS

January, 1951 • Vol. 94 • No. 1

Roads and Streets represents 59 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892

E. S. GILLETTE, Publisher



HALBERT P. GILLETTE, Editor-in-Chief

Coming Articles

How Far Along Are Our Expressways?

A round-up of latest news on urban expressways in a score of large cities, will be presented soon.

Blizzard in the Eastern States

How city and road officials were equipped—and not equipped—for restoring traffic after the unprecedented storm of late November.

Behind the Lines with Successful Contractors

Resuming this series of articles on contractor shop and off-season preparation methods.

Hard Facing—the Contractor's Friend

Methods recommended for various familiar earthing applications will be reviewed, with diagrams and pix-guide to shop foremen and construction welders.

Developments in Airport Design

Summary of the important post-war effort to revise design curves for both flexible and rigid pavements, in light of pavement evaluation and test sections, and extend these curves for very heavy planes.

Scraper and Shovel Jobs

Contractors again make big yardages on earthmoving projects during 1950 season. Watch for a new series of reports on outstanding "blue ribbon" projects.

Winter Meetings

Detailed reports on Highway Research Board, Associated Equipment Distributors, Association of Asphalt Paving Technologists, American Road Builders' Association, and other conventions.

Also Coming Along

Soil-Cement Roadbuilding Methods in North Carolina . . . Construction methods reports on several recent airport jobs . . . State-wide coordination of traffic safety efforts . . . Reflector prism as an aid in surveying work.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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B.F. Goodrich



The fire that should lose but doesn't

WHEN water, sharp rocks and rubber start fighting—it's usually the tire that has the handicap. The water acts as a lubricant, causing the tires to spin—while the sharp rocks cut at the slipping rubber.

But the BFG Rock tires shown above are an example of how B. F. Goodrich builds tires to lick tough problems.

To resist cutting, these tires have a special, tough tread—compounded for rock service. To resist slippage, the heavy cleats on the shoulders are non-directional . . . they dig in for a non-slip bite, in forward or reverse. To give real shock protection to the cord body, these and other B. F. Goodrich off-the-road tires have a patented *nylon*

shock shield (double in larger sizes).

Found only in BFG tires, the shock shield is made of two nylon cord breakers. This is vulcanized between the tread and cord body to protect the life of the tire against the shocks of hard service.

The Wallowa County Road Department office in Enterprise, Oregon, operators of the equipment shown above, have this to report: "The B. F. Goodrich tires have given longer and better all-around service than any other brand we have used." In other words, the tire that's hard to cut is the tire that cuts costs.

Whatever job your off-the-road equipment must perform, there's a

special BFG tread built to help you do it better. In addition, you get the exclusive protection of the nylon shock shield at no extra cost.

So see your B. F. Goodrich dealer. And specify BFG tires for your new equipment. Enjoy the longer life and lower operating costs offered by *The B. F. Goodrich Company, Akron, Ohio.*



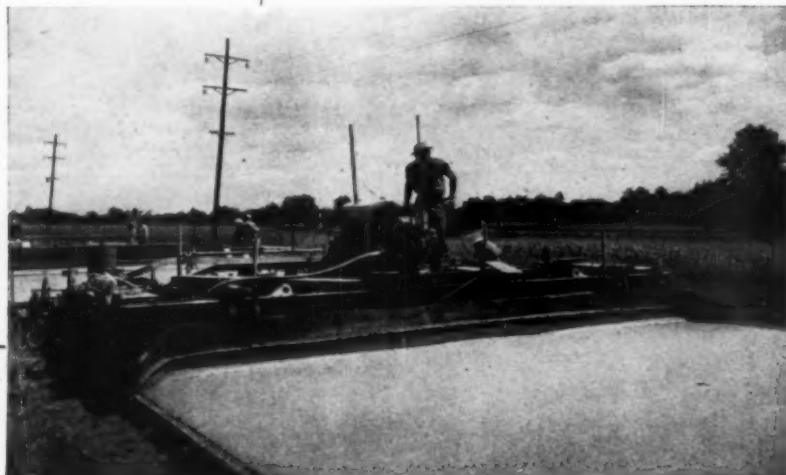


Better for paving work

Contractors find that a mix made with Duraplastic air-entraining portland cement dumps, spreads and finishes easily. And it allows finishing closer to the paver, gives earlier protection for curing. Duraplastic requires less mixing water for a given slump, makes concrete more workable, more plastic, more cohesive and more uniform.

Makes more durable concrete

Duraplastic minimizes bleeding and segregation. Thus, the finished concrete is fortified against effects of freezing-thawing weather. And it is highly resistant to the scaling action of de-icing salts. (Below, screeding Duraplastic concrete on U. S. #24 dual-lane highway; Roanoke to Huntington, Ind.)



YET DURAPLASTIC* COSTS NO MORE

It sells at the same price as regular cement and requires no unusual changes in procedure. Complies with ASTM and Federal Specifications. For descriptive booklet, write Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Avenue, New York 17, N. Y.

*"Duraplastic" is the registered trade mark of the air-entraining portland cement manufactured by Universal Atlas Cement Company.

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RB-D-116

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GarWood DOZERS

FOR NEW PRODUCTION RECORDS



**Matched with NEW
ALLIS-CHALMERS
HD-15 Tractor**

**GAR WOOD Model CD-153 Cable
Dozer (shown with Model 151
Front Mounted Control Unit)**

**GAR WOOD Model CT-153
Cable Tipdozer**

**GAR WOOD Model HD-153
Hydraulic Dozer**

**GAR WOOD Model HT-153
Hydraulic Tipdozer**

**Matched with NEW
ALLIS-CHALMERS
HD-9 Tractor**

**GAR WOOD Model HT-93
Hydraulic Tipdozer (shown)**

**GAR WOOD Model HD-93
Hydraulic Dozer**

GAR WOOD INDUSTRIES, INC.

Findlay Division • Findlay, Ohio

**MANUFACTURERS OF GAR WOOD TRACTOR EQUIPMENT
FOR ALLIS-CHALMERS INDUSTRIAL TRACTORS**



**SEE
INSIDE**

now TWO MORE

HD-9

WEIGHT: 18,500 lb.
70 DRAWBAR Hp.
GM 4-71 DIESEL ENGINE

SPEEDS: 6 forward, to 5.68 mph.;
3 reverse, to 4.43



ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

The World's Most Modern Line of Crawler Tractors

Here's

BIG NEWS

for Tractor Users

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- ✓ For
- ✓ For

Completely New Allis-Ch

NEW POWER RATING

POWER, WEIGHT, BALANCE put them in a class of their own — never such traction . . . such pulling, pushing or lifting ability. And the smooth-operating GM 2-Cycle Diesel engines work without strain under the most extreme conditions.

NEW STRENGTH

All parts are designed and built to carry their loads with a margin of safety. No need to go to a larger tractor just for strength alone. The HD-9 and HD-15 set new standards for tractor quality.

NEW DESIGN SIMPLICITY...

for Easier Control and Greater Operator Comfort—Easy-shift transmission • Self-energizing brakes • Booster steering controls • Adjustable, cushioned seat • Wide arm rests • Convenient controls and pedals • Full visibility • Instant electric starting.

for Simplified Servicing—Unit construction permits removing major assemblies without disturbing companion groups • Extended lubrication periods throughout—1,000 hours on truck wheels, idlers and support rollers.

Complete Line of Matched Equipment, Developed in Cooperation With Allied Manufacturers, Available For Both The HD-9 and HD-15

- ✓ For Greater Production
- ✓ For Easier Operation
- ✓ For Simplified Servicing



OUT AHEAD

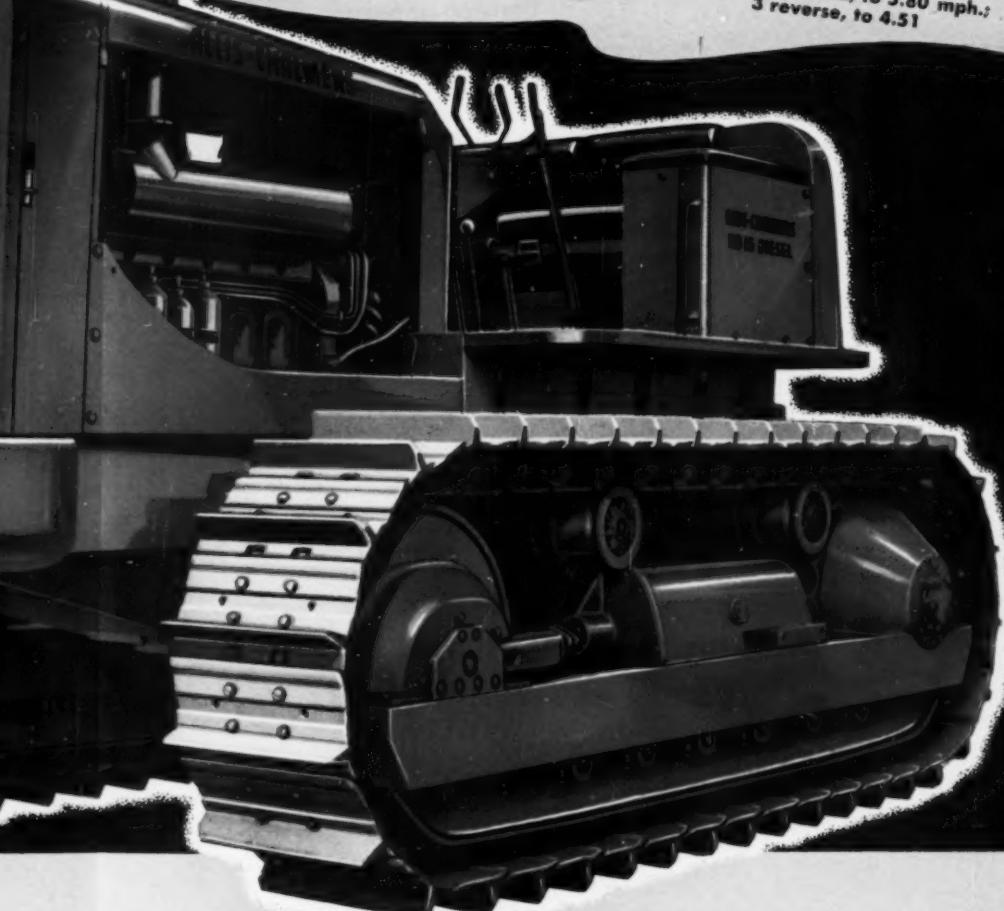


Modern
sets No

Allis-Chalmers Tractors

HD-15

WEIGHT: 27,500 lb.
102 DRAWBAR Hp.
GM 6-71 DIESEL ENGINE
SPEEDS: 6 forward, to 5.80 mph.;
3 reverse, to 4.51



**Modern Allis-Chalmers Line
sets New Tractor Standards**



Each of these four Allis-Chalmers crawlers gives you a new yardstick for rating tractors. Each brings you a new kind of performance . . . plus new strength, operator comfort and service simplicity. For the finest in crawler tractors, see your Allis-Chalmers dealer.

COMPANY

cent for 43 Years

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Introducing

3

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AC Tractors

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ROOT RIPPER

FOR

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WD-8, WD-15

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ON THE FACE OF THE EARTH.

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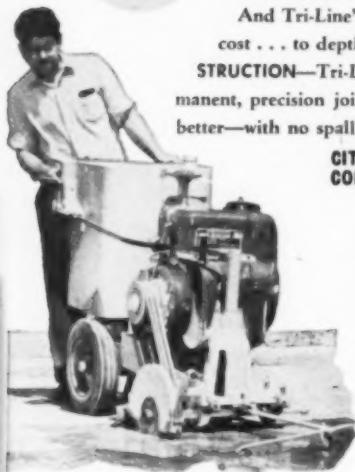
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Specialists in Hydraulic and Cable-Controlled Earthmoving Equipment for 43 Years

2 EASY STEPS TO MODERN PAVING REPAIR

SAVE TIME . . . SAVE LABOR . . . REDUCE MAINTENANCE COSTS

STEP
No. 1



GET COMPLETE FACTS ON THESE OUTSTANDING TRI-LINE FEATURES

One-man, three-wheel steerable design
Long blade life—no bind or pinch
Direct-acting hydraulic control
Powerful gasoline engine drive
Electric motor drive (optional)

CITIES, COUNTIES, STATES AND PRIVATE CONTRACTORS USE TRI-LINE CUTTING FOR:

Street and highway maintenance
Sewer, water, or gas main construction
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COMPLETE the

OPENING JOB
with the one-man

"Ottawa" SELF-PROPELLED HYDRA-HAMMER (MPT) Multi-Purpose Tool

Follow your cutting job with the MPT. Again, one machine, one unskilled operator. Start breaking—easily, quickly—with no back-fracturing. If necessary, tamp backfill with the same machine

... fast and easy! The "Ottawa" one-man, self-propelled Hydra-Hammer is hydraulically powered . . . completely self-contained . . . capable of performing many jobs . . . breaking concrete, tamping backfill, cutting asphalt.

Tri-Line CONCRETE CUTTERS

are manufactured by

TRI-LINE CO.

931 Carroll Street

RACINE,
WIS.

The OTTAWA Self-Propelled MPT—

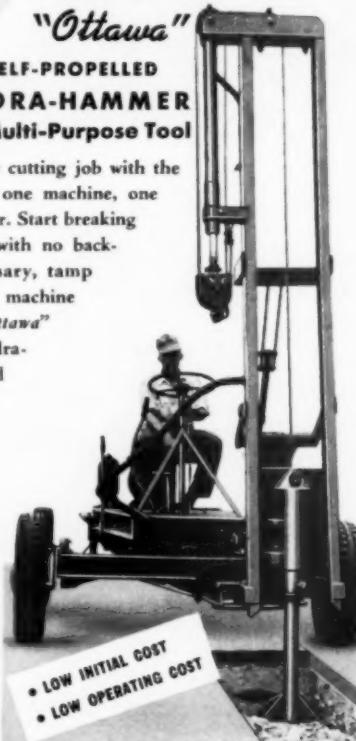
Moves quickly from job to job Requires no additional costly, cumbersome equipment Free-falling hammer design prevents any shock to operator or machine Controlled impact insures against water, gas, or sewer pipe damage Tamps—with better compaction—holes up to 4 feet wide, 10 feet deep.

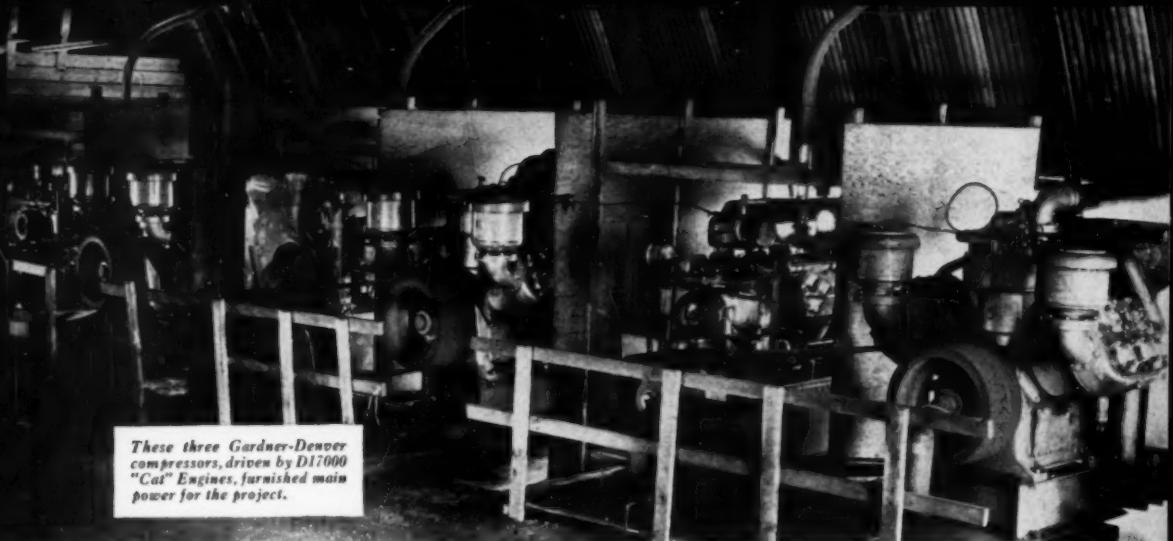
• **The "Ottawa" SELF-PROPELLED
HYDRA-HAMMER is manufactured by
OTTAWA STEEL PRODUCTS, INC., OTTAWA, KAN.**

YOU BE THE JUDGE...

Let us arrange a free demonstration of "Tri-Line" and "Ottawa" machines on your job. Write for catalogs, prices and name of nearest distributor.

STEP
No. 2





These three Gardner-Denver compressors, driven by D17000 "Cat" Engines, furnished main power for the project.

Drill Power on the Big Thompson



Stand-by power was supplied by two portable compressors, driven by D13000 Engines.



The mouth of the Big Thompson tunnel, entering rocky hillside near Loveland, Colo.

A VITAL link in the Big Thompson water diversion project is a mile-long, 8-foot tunnel west of Loveland, Colorado.

Tarloton Construction Co., of Loveland, drove this tunnel through hard rock, and all power for drilling was supplied by "Caterpillar" Diesel Engines. Three D17000s, driving stationary Gardner-Denver compressors, were the main power source. And two portable compressors, powered by D13000 Engines, were used to round out this air compressor team.

Over the years, "Caterpillar" Diesels have built a solid reputation for durable construction, simplicity, economy, long, dependable work life and excellent dealer service. That's why they are standard power in leading makes of compressors, crushers, excavating machinery and other types of heavy-duty equipment.

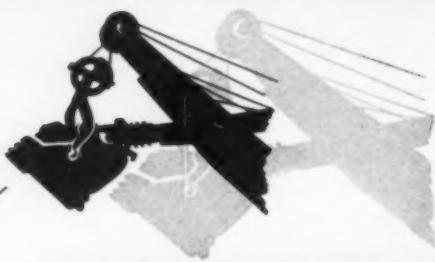
Today the importance of "Caterpillar" products, both for military use and for maintaining the national economy, is greatly increased. Talk over your machinery requirements with your "Caterpillar" dealer. He has ample parts stocks to keep your present equipment doing its job and will do his utmost to make prompt delivery of new machines.

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT



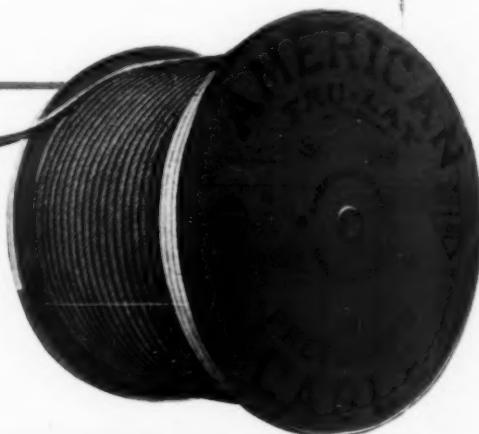
*Just as some shovels
last longer than others...*

TRU-LAY...

*will give you more of everything
you want from **wire rope***

• TRU-LAY WIRE ROPE is preformed and made by the men who originated preforming. In it toughness and strength are properly combined to give better and longer service regardless of job conditions. Users like its easier handling qualities and the fact that it is available in all constructions, lays, centers and grades.

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30% more work
with
ADAMS
No. 610



● Read what Freshour Bros. Contracting Co. has to say about its Adams No. 610 Motor Grader.

This experience is typical. King of all heavy-duty motor graders the Adams No. 610, with 100 H.P. diesel engine, has the weight, power and speed to

J. D. ADAMS MANUFACTURING COMPANY • INDIANAPOLIS, INDIANA

FRESHOUR BROS.
CONTRACTING CO.
P. O. BOX 77

SWEET HOME ARK.
June 30, 1950

J. D. Adams Manufacturing Co.
217 S. Belmont Ave.
Indianapolis, Indiana

Dear Sirs:

We wish to report how well pleased we are with our 610 Adams Motor Grader that we purchased over a year ago. This machine has spread the base gravel, help mix the mineral aggregate and spread all the bituminous material on thirty-five miles of State highways to date.

We have found that this machine will do at least thirty per cent more work than any other heavy-duty machine that we have ever owned or rented.

It is a pleasure for us to recommend it to any one in the market for a motor grader.

Yours truly

FRESHOUR BROS.

By Ernest Freshour

*Make your next
motor grader an* **ADAMS**



"That's what I call **SERVICE!**"



Link-Belt Speeder distributors give you on-the-job service—never let you down when time really counts.



In modern shops like this, factory-trained servicemen of your Link-Belt Speeder distributor give you fast, complete service.



Complete stocks of parts at your Link-Belt Speeder distributor mean no costly delays.

Down-time is no problem when you're operating a **LINK-BELT SPEEDER**

When you're counting minutes in dollars, you want service *now* . . . not next week! And you want parts replaced on the spot . . . not at some distant factory. Furthermore, you want repairs made by men who know every move to make . . . not by boys who have to look in the book.

Service for your Link-Belt Speeder measures up to these requirements . . . and more. It is a factory-planned and directed service, through selected distributors equipped with modern shops, complete stocks and highly-skilled, factory-schooled personnel. That's why you can depend on a Link-Belt Speeder for more service, for more kinds of work, more of the time.

12-227

LINK-BELT SPEEDER
CORPORATION

Builders of the most complete line
of cranes, shovels and draglines
CEDAR RAPIDS, IOWA

TORTURE TAKERS

RECORD BREAKERS

MONEY MAKERS

Firestone TIRES



TIRES used in rock work, strip mining, and earth moving have to face a terrific amount of torture. Whether they make or lose money depends on how well and how long they can take that torture.

Firestone tires can TAKE it. Time and again they break old performance records, set new records for long service. Such performance is no accident. The extra tough, job-designed treads and the all-rayon Gum-Dipped cord bodies — protected by four extra impact plies and extra-thick sidewalls — explain why Firestone tires turn in *better* work and turn out *more* work.

Not far from your project there's a Firestone Dealer or Store organization prepared to handle your complete tire needs and lower your operating cost. They will welcome the opportunity to call on you and show how this can be done.

WHEN YOU BUY NEW EQUIPMENT OR REPLACEMENT TIRES
SPECIFY FIRESTONE OFF-THE-HIGHWAY TIRES

Listen to the Voice of Firestone on radio or television every Monday evening over NBC

Copyright, 1950, The Firestone Tire & Rubber Co.

When writing advertisers please mention ROADS AND STREETS, January, 1951

OUT AHEAD

with GM DIESEL POWER!

HD-20—41,800 lbs. of properly balanced weight; long, wide sure-gripping tracks and the new GM 6-110 Diesel engine driving through hydraulic torque converter give the Allis-Chalmers HD-20 brute strength to take toughest jobs in stride.



HD-15—27,500 lbs.—102 Drawbar H.P.—powered by a 6-cylinder GM Series 71 Diesel engine.



HD-9—18,500 lbs.—70 Drawbar H.P.—powered by a 4-cylinder GM Series 71 Diesel engine.



General Motors 2-cycle Diesel engines supply the hard-hitting power that enables Allis-Chalmers' great new line of tractors to outwork all others.

Four and six-cylinder GM Series 71 engines driving the HD-9 and HD-15—and the powerful new GM 6-110 engine driving the HD-20—give these new tractors a reserve of smooth, dependable power for easy handling, increased work and minimum maintenance.

The greater efficiency of 2-cycle operation and direct fuel injection simplifies design and enables these engines to produce far more horsepower than other Diesels of equal size and weight. Interchangeability of Series 71 engine parts provides maximum availability—keeps them on the job.

That's why GM Diesel engines are chosen to power not only the "World's most modern line of crawler tractors"—but more than 500 different kinds of machinery built by 120 manufacturers.

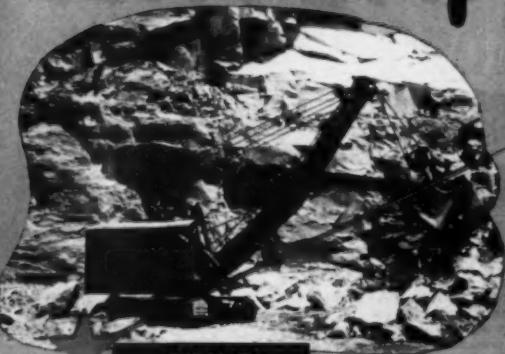
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SINGLE ENGINES...Up to 275 H.P. DETROIT 28, MICHIGAN MULTIPLE UNITS...Up to 800 H.P.
GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK



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WEIGH ALL THE ADVANTAGES



WHETHER SHOVEL, CRANE, DRAGLINE,
PULLSHOVEL or TRUCK CRANE

a star on every job!

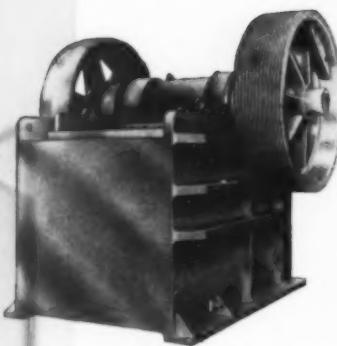
NORTHWEST

CRAWLER and TRUCK MOUNTED SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

for GREATER PRODUCTION CAPACITY
for INCREASED PLANT EFFICIENCY
for LOWER OPERATING COSTS

INSTALL

for crushing

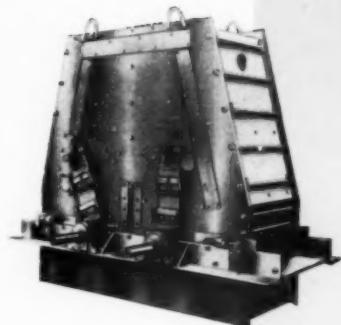


JAW CRUSHERS

HERE'S the high capacity primary crusher that sets the production pace for your entire plant! Cedarapids quality-built Jaw Crushers are the overhead eccentric type with one stationary jaw and one movable jaw and are engineered for extra capacity with smooth, steady performance plus low operating and maintenance costs. There's a size for every need from 6' x 12" to 32' x 40".

DOUBLE IMPELLER IMPACT BREAKERS

THIS is the unit that assures greater hourly tonnage capacities of the cubical shaped aggregate required in so many specifications today. Used for both primary and secondary reduction in many applications, its extremely high ratio of reduction eliminates much accessory equipment such as secondary crushers, screens, conveyors, etc. Less horsepower required because a high percent of material is broken in suspension. 50% less contact of stone on metal reduces wear on working parts. Four sizes available.



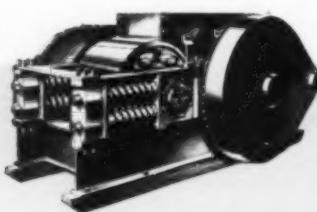
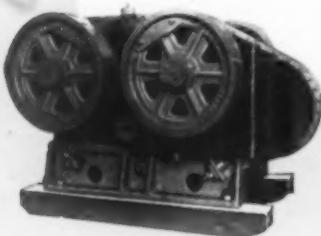
Use Cedarapids Crushers in your plant to be sure of meeting production schedules

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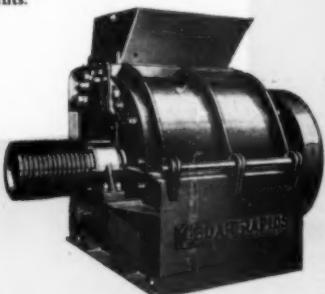
ROLL CRUSHERS

For secondary crushing, Cedarapids Roll Crushers assure high production of the required smaller size aggregates. Manganese steel roll shells, either smooth or corrugated, and large, heavy flywheels, plus other heavy-duty construction features provide maximum long life and economical operation. Cedarapids exclusive patented safety shear plates prevent crusher damage from foreign material. Sizes range from 16" x 16" to 40" x 24".



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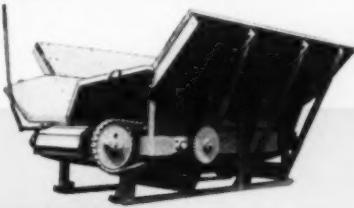
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Apron type or reciprocating feeders provide a smooth, workable flow of material to crushers, conveyors and bucket elevators, preventing overloads and surges. Available in a wide variety of sizes for all types of aggregate or asphalt plants.



BINS

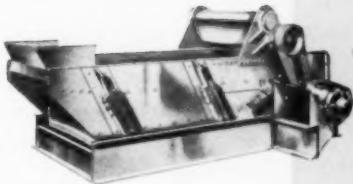
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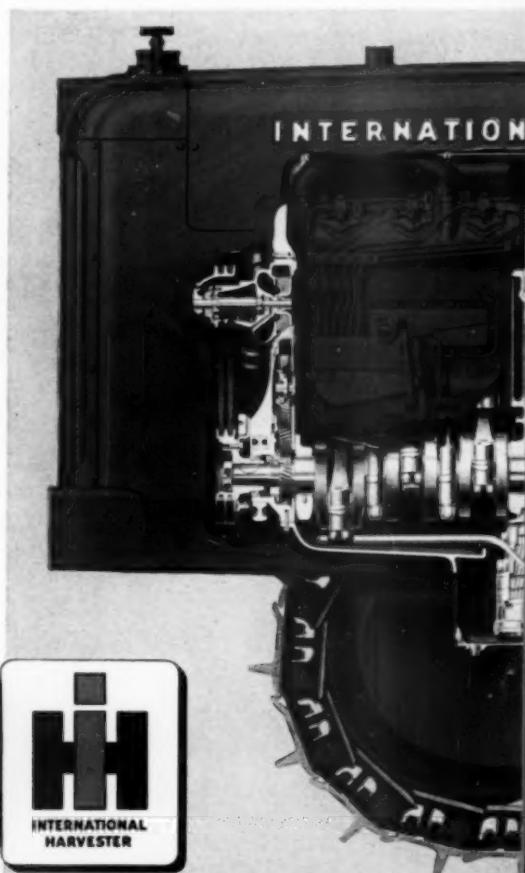
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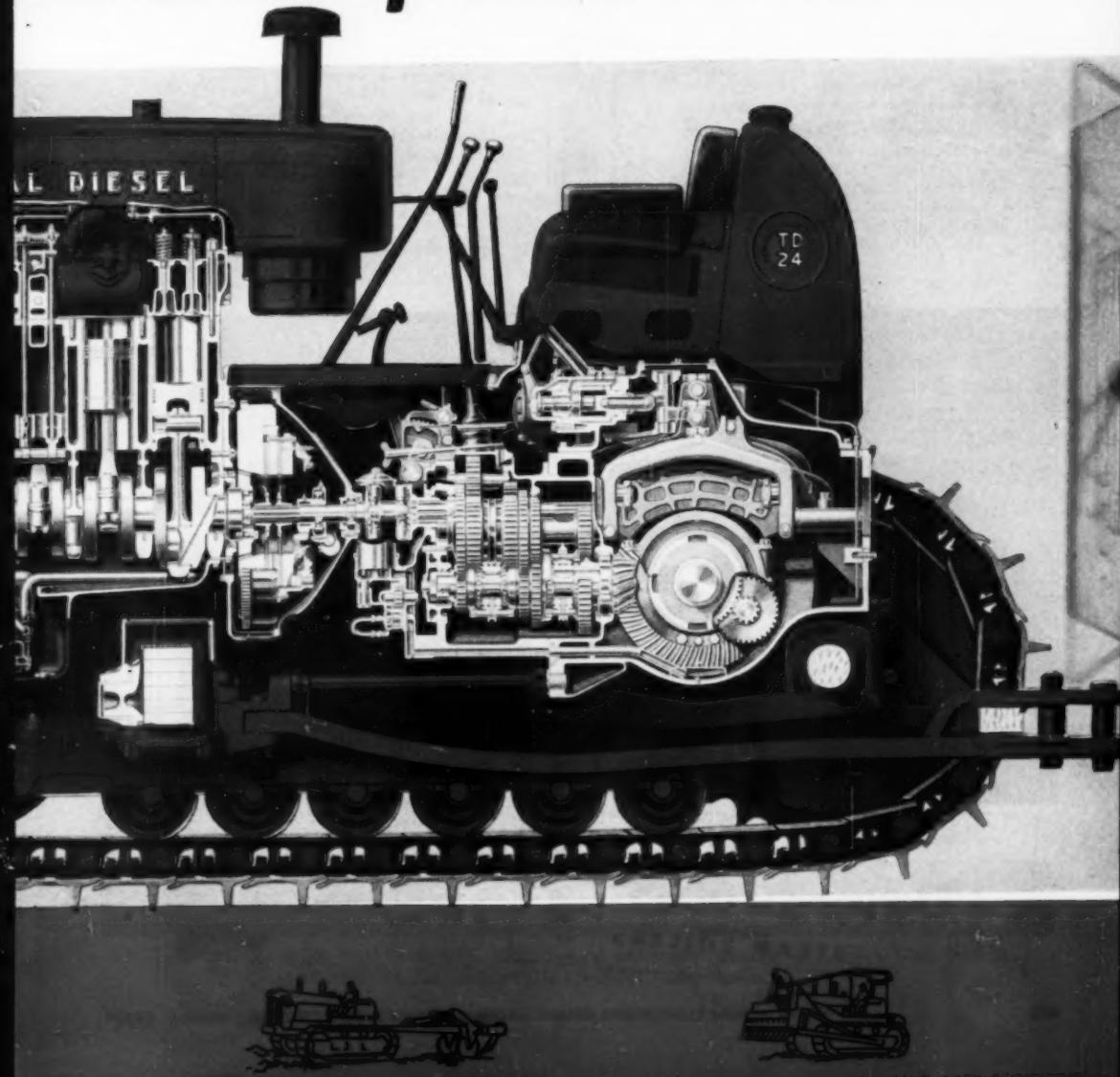
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inside story of the TD 24



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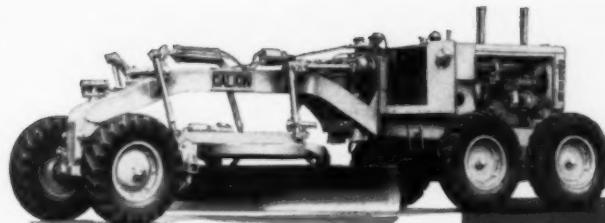


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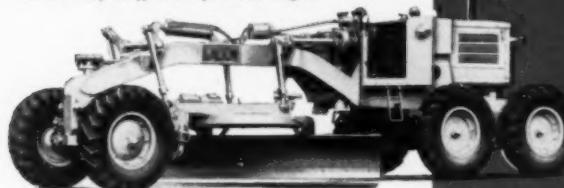


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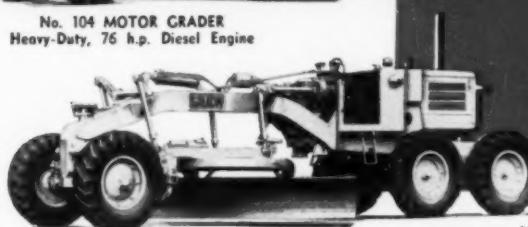




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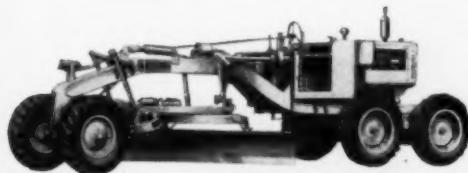
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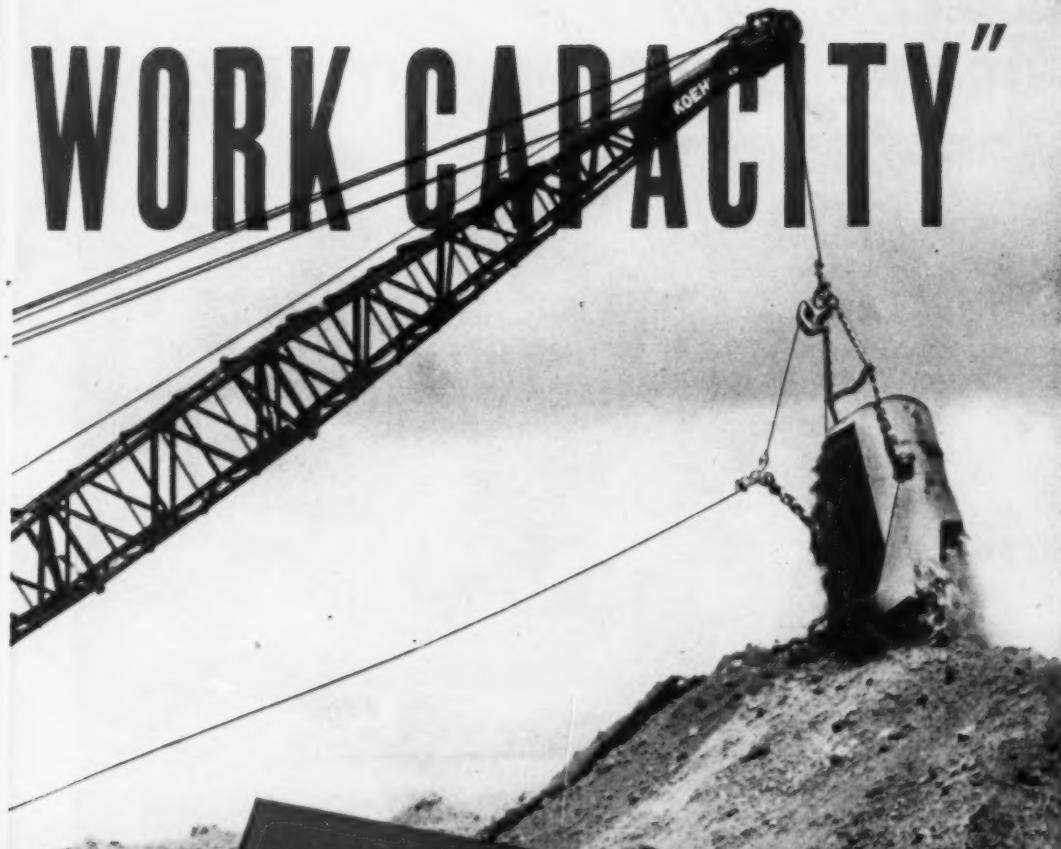
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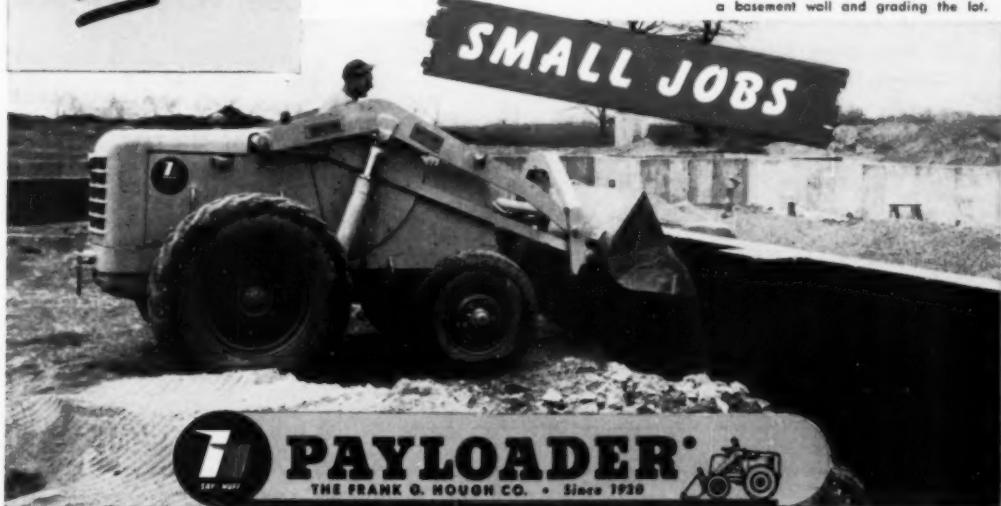
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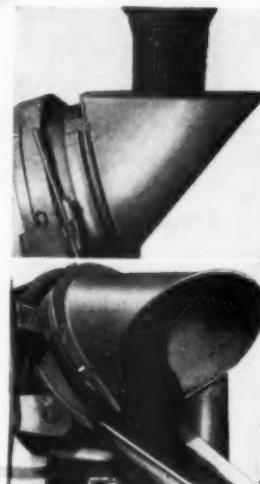
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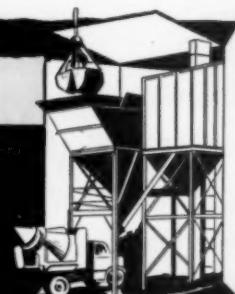


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New Jersey Turnpike Contractors

COMPLETE \$41,000,000 OF WORK DURING 1950 SEASON

*Substantial portion of grading completed in record-breaking first-year push, despite wet weather and right-of-way delays. Over 25,000,000 cu. yd. of grading and roadbed materials moved. Nearly 3,800,000 lin. ft. or most of vertical sand drains in place by year end. All paving work awarded. Completion of 264 major structures looms as major effort in race to open Turnpike by end of 1951.**

IT'S perhaps too soon to breathe easy, but the personnel of the New Jersey Turnpike Authority, together with their consultants and contractors, can feel encouraged as the first construction year winds up on their \$220,000,000 2-year road-building project. The score as this was written just before Christmas was indeed amazing:

1. Contracts awarded: 67 contracts between Jan. 19 and Dec. 15, 1950, totaling \$160,000,000 in value. These encompass all grading, paving and structural work. Contract awards were made periodically throughout the year, the bulk of the grading, however, getting under way by mid-summer.

2. Work completed: Accumulated monthly estimates rose gradually to a peak of \$34,000,000 in November and were expected to total about \$41,000,000 for the year. Grading and related work, including sand drains, stood approximately 60% completed, representing the movement of over

25,000,000 cu. yd. of various kinds of excavation or roadway materials. Over 3,800,000 lin. ft. of the vertical sand drains were installed. Structural work completed, mostly in the footing and substructure stage, stood at about one-fourth done, with fabricators and contractors getting set to begin placing some of the larger superstructure jobs.

One contractor alone, Geo. M. Brewster & Son, Inc., completed over \$2,000,000 worth of work in October. Other contractors also pushed with

speed to offset a late start and mid-summer weather delays.

Grandview's 180 Machines

Typical of the contractors working in the dry-land sections south of the tidal meadows, is Grandview Construction Corp., of Mt. Vernon, N. Y. This company, composed of three Mirabelli brothers, had the longest section of the Turnpike (24½ mils) and perhaps the largest excavation and roadbed yardage of any contractor outside the Meadows. October was their peak month, with about 900,000 cu. yd. moved, the company's fleet reaching a peak of 45,000 cu. yd. per 10-hour day.

To do clearing and grading, build several major structures, and perform other work, the Grandview company assembled 180 machines comprising one of the largest fleets of earthmoving equipment in the East. Some of

*An outline of the New Jersey Turnpike project by Col. V. J. Brown, Associate Editor, appeared in Oct. '50 Roads and Streets.

★ Grandview Construction Corporation, which had 24½ miles of the Turnpike grading (longest mileage of any contractor) found 2-way radio invaluable. Jim Mirabelli, of the firm, is seen at left listening in as Pete Young, superintendent, discusses a problem with the field office.





★ Sand drain installation was performed on most Turnpike contracts with special McKiernan-Terry units, consisting of hammer, special alloy-steel leads, and sand skip. On Geo. M. Brewster's contract 18, compressed air for hammer operation and for extracting the mandrels was supplied by batteries of 500-cfm. LeRoi compressors mounted on special multi-tired trailers. Surge tank 12 ft. long mounted along other side of trailer

the items are shown in the accompanying tabulation.

The Grandview firm's stretch was in flat to rolling terrain, with cuts and fills up to 20 ft., and one 90-ft. fill for the approach to the Raritan River bridge. This last-mentioned fill was successfully completed by building fill outward into the stream-side marsh and using a floating dredge to keep the muck cleaned out ahead of the toe. Grandview's work included over 2,500,000 cu. yd. of borrow excavation for embankment, sub-base and base.

The contracts were awarded Feb. 28, but work didn't get under way in earnest until about June 1. By December 1 the company had moved 4,500,000 of its 5,500,000 cu. yd. of work.

This contractor elected to work one shift only, in the belief that not enough first-class equipment operators and other personnel could be obtained to man a second shift. Sometimes even the single shift was worked with machines down for lack of men who could be trusted to run them properly.

Grandview's job was split into two sections for operation and management. Pete Young was superintendent under Jim Mirabelli, project manager, and Don Mirabelli, general superintendent.

Big Fills Saved \$4,000,000 (Pictures on pages 38 and 39)

A feature of the Turnpike construction across the New Jersey meadows is a pair of high embankment sections, located in Contract 2 in the in-



★ Brewster's Contract 18—International TD-24 bulldozer spreading granular subgrade material over the sand blanket, with Mack diesel truck dumping sand at rate of 5,000 to 10,000 cu. yd. daily. Brewster's projects, in all, will involve hauling over 4,000,000 cu. yd. of material in trucks

★ Construction Aggregates Corporation-Peter Kiewit Sons' Company, contract 19, Sec. 6-7. This contract includes over 3,000,000 cu. yd. of sand borrow, hydraulically placed on the marsh, as the largest bid item in a \$5,800,000 job. Sand being brought into a nearby ship basin by scows, dumped and pumped via dredge through 20-in. spiral welded pipe (40,000 ft. of pipe on job)



★ How the New Jersey Turnpike approaches New York City—seen taking form along the tidal meadows, across the picture in the foreground. To the left it continues several miles to connect with the George Washington Bridge. Toward right of picture, Turnpike "Y" leads to the mid-town Lincoln Tunnel under the Hudson River, seen in the distance.

terval between the Passaic and Hackensack river bridges. The fills extend 1100 and 2300 ft. along the road, with a gap left for an overpass over Belleville Turnpike. The fill was built to a maximum depth of 54 ft., or 62 ft. including material sunk into the muck. Part of this height is surcharge, placed to hasten settlement to the point of stability. The finished grade at the beginning of the Passaic River bridge will be +39, with a similar surcharge now in place. The lowest grade between bridges will have an elevation of +16 with 5 ft. surcharge. The meadow mat in this area lies at about +2 ft.

Preliminary plans for this stretch called for connecting the Passaic and Hackensack bridges with a steel viaduct, estimated to cost about \$6,000,000. Some of the engineers believed this to be the only safe method of traversing the marsh without dropping to the level of a shallow earth fill, which would have entailed undesirable roadway grades. However, exponents of the vertical sand drains presented data which convinced Turnpike authorities of the feasibility of higher fills, and the solid embankment design was adopted. Filling was begun in the summer and completed in October. Settlement progressed at a rate which gradually diminished until today the fills are approaching stability for the final fill after removing the overload.

The layer of subsoil under the fills consists of meadow peat and organic clay from 4 to 12 ft. deep. Underlying this is a gray clayey sand 2 to 12 ft. deep or deeper in spots. Below the sand lies very soft clay and silt

in varying depths up to about 100 ft. below the original marsh level.

Sand drains were placed under the fills in grid spacing varying from 6 to 12 ft. and to depths from 70 to 98 ft. Normal diameter of drains was 14 in. The drains were driven to firm bottom at depths predetermined by core borings and checked by blow counts during the last foot of mandrel driving. About 10,000 drains totaling 850,000 lin. ft. were required under the 3400 ft. of high embankment. Drains were installed with 6 rigs working 3 shifts. The fill placed required 25 to 90 trucks working 2 shifts and placing 2500 to 9000 cu. yd. per day.

Sand Drain Methods

Note from one of the photos (bottom of p. 39) how this fill is widened out in the distance. This widening, which occurs at an overpass site, represents the fill width ultimately to be required when and if the Turnpike is someday enlarged from the initial 6-lane to an 8-lane dual-dual road. Experience in the deep marsh areas has shown the desirability of building all fills in advance of the adjacent structural work, so as to give the time for the fill to settle and for lateral creep of the underlying soil to occur, if any, prior to construction of abutments and adjacent piers.

It is interesting to note that along the high fill here described, only the most minor and negligible lateral displacement of less than 1 in. usually has occurred in the bordering marsh soil, indicating the effectiveness of the sand drains in producing solidification and stability of the marsh structure.

The New Jersey Turnpike roadbed will include the largest footage of vertical sand drains ever to be employed on a single construction project. Upward of 4,500,000 lineal feet—

Some of Grandview's 180 Machines

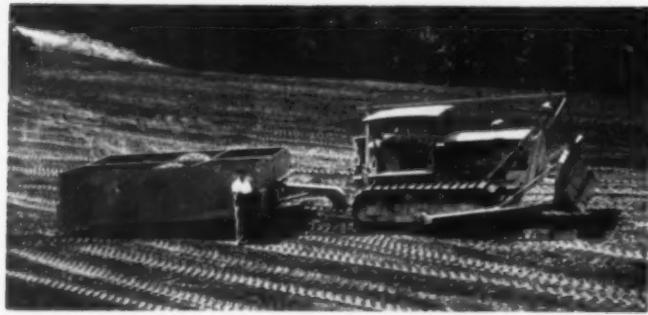
- 42 Euclid 14-yd. bottom-dump wagons (General Motors and Cummins engines)
- 6 Euclid end-dump wagons (12 ton)
- 2 Euclid loaders (Model 7BV with General Motors engines)
- 2 Northwest 80-D shovels (2½-yd.)
- 24 Allis-Chalmers HD-19 tractors (some with dozers, incl. Gar-Wood, Baker, other makes)
- 4 Allis-Chalmers HD-14 tractors (with dozers)
- 1 International TD-24 tractor
- 14 Caterpillar D8 tractors (some with dozer)
- 5 Caterpillar D7 tractors (some with dozer)
- 2 Caterpillar D6 tractors
- 11 LeTourneau scrapers
- 7 LaPlant-Choute scrapers
- 3 Gar-Wood scrapers
- 2 Caterpillar 80 scrapers
- 1 Bucyrus-Erie scraper
- 10 Tournapulls
- 6 LaPlant-Choute TS-300 motor scrapers
- 3 Caterpillar No. 12 motor graders
- 2 Austin-Western Motor graders
- 4 Bay City cranes (backhoe equipment)
- 1 Bay City truck crane
- 1 Bros 50-ton compactor
- 3 Bros pneumatic rollers
- 6 4-drum sheepfoot roller units
- 2 machinery trailers
- 2 10-wheel flatbed trucks
- 4 dump trucks (1 Ford, 3 Dodge)
- 3 welding trucks
- 2 tire trucks
- 4 lube trucks
- 5 parts trailers
- 4 office trailers
- 5 other closed trailers
- Miscellaneous jeeps, pickups, automobiles,
- 8 mobile radio telephone units (Link, Motorola)
- 1 30x50 ft. sectional steel field shop (Rodgers hydraulic press, other equipment)



★ A row of pressure gauges installed along the project near Secaucus



★ Hollow tubes, for pore pressure reading gauges, being driven into the partially completed marsh fill by one of Brewster's Dodge Power Wagon outfitts. A winch drum working from a power take-off is used to raise and drop a heavy steel cylinder which rides a shaft and drives a section of plugged pipe to desired depth



★ One of the large rubber-tired compactors used on the Turnpike to meet rigid compaction requirements (Porter Super-compactor)

or more than 900 miles—of these sand piles (as against 3,800,000 ft. originally estimated) are being placed, the major portion being located under 11.8 miles or 10% of the Turnpike's roadway. While such drains are being required for local areas at stream crossings and elsewhere along the project, the bulk of the footage is concentrated in the tidal "meadows" in Section 6-7 at the project's northern end.

The following notes were prepared during the course of the summer's work by resident engineers for Edwards, Kelcey, Frederic H. Harris, Inc., and O. J. Porter & Co., Associates, consulting engineers on Section 6-7. While they specifically pertain to Contracts 2, 11 and 18, held by Geo. M. Brewster & Son, Inc., the methods and details with minor variations apply to those employed on virtually all vertical sand drain installation on the Turnpike.

Sand drains are placed by equipment working on a platform of sand spread over the marsh. Sand drain equipment on these contracts consists of crawler cranes equipped with compression leads from 50 to 130 ft. long for driving and pulling the steel pipe

mandrel. A chute is welded to the upper end of the mandrel to permit filling it with sand. The assembly is fitted with an airlock, hinged gate and hose connections at the top. The lower end of the mandrel is closed by a hinged steel plate plug 1 or 2 in. larger in diameter than the mandrel. The plug is hinged to the mandrel by cable or a few links of chain welded to the inside to permit the plug to swing open as the mandrel is withdrawn.

The mandrel is driven by an air

hammer to the required depth and is filled with sand while driving through the last few feet. The airlock is then closed and 100 to 125 psi. of air pressure applied. The air pushes the sand out of the mandrel and packs it into the hole, as well as helping to withdraw the mandrel from the ground.

After the sand drains are completed, fill placement is started in 6-in. layers which are compacted to 90% of maximum density. At lower elevations the fill loading has generally been limited to 2 to 4 ft. each four days. At higher elevations placement is limited to 2 ft. in seven days, more or less, according to the readings of pore pressure gauges and other controls installed throughout the marsh foundation.

Displacement stakes are installed at various locations and depths to indicate progress of the consolidation and for purposes of control. The rate of fill is determined always by reading of displacement stakes and pore pressure gauges. These data indicate whether or not increments of fill can be added safely at the rate or faster than originally planned.

Settlement platform readings indi-

Vertical Sand Drain Stabilization Made This

★ The high fill between the Passaic and Hackensack bridges, during construction late in 1950 summer





★ Brewster performed compaction of subgrade and blanket material by means of various units, including this sand-loaded scraper provided with an extra rear axle and two added tires



★ The high fill on Contract 2 is seen here being trimmed to a neat slope with Brewster's Gradall machine

cate the amount of settlement and provide a basis for payment to the contractor for fill in place including settlement. The fill settlement to date after 3 to 6 months on Contracts 2 and 11 ranges from 5.5 to 8.3 ft. and the shift of the adjacent marsh displacement stakes has ranged from .27' to .31' outward and .04' to .18' upward.

On Contract 18, lying on north in the area near Secaucus and the Lincoln Tunnel approach, Geo. M. Brewster & Son, Inc., encountered muck and soft clay (mud) ranging from 60 to 170 ft. During the autumn months this contractor installed as high as 27,000 lin. ft. of drains per day with depths ranging from 90 to 100 ft. To place this footage five sand drain rigs were used, usually working in groups of two, three or more, so that flexibility could be achieved in the use of various combinations of compressors to meet minute-to-minute air demands.

Notes on Grading

Compressed air for operating the hammers and extracting the mandrels was supplied by 500-cfm. LeRoi compressors, mounted on special multi-tired trailers.

It will be remembered from the arti-



★ Loading sand into skip for charging sand drain mandrel. Hough loader, one of several employed for this work by Geo. M. Brewster & Son, Inc.

cle in Oct. '50, *ROADS & STREETS*, that compaction requirements for roadway foundation, embankment, subbase and base are perhaps the most rigid ever set up for a major highway project. As part of a design for a maximum single axle load of 36,000 lb., the following elements are required, working from the ground upward:

1. Soil foundation under cut and embankment areas. All cut areas, after removal of spongy or otherwise unsuitable material, are required to be compacted to not less than 95% of maximum density (modified AASHO). Where fills 5 ft. deep or deeper are placed over cultivated or

disturbed soil, the underlying soil has been compacted to not less than 90% of maximum density for a depth of 12 in. below original ground (or undercut) level.

For shallower embankments the underlying soil is required to be compacted to at least 4 ft. below top of finished pavement, to a density of 95% of the modified AASHO standard. This was accomplished by rolling with heavy equipment or by excavating material and replacing and recompacting it in 6 in. layers.

In setting up specifications for this latter compaction, the engineers gave the contractors leeway to perform the compaction by any acceptable method. If no acceptable alternate method were offered, the contractor had to excavate 6 in. down, plow the remaining 6 in. of depth, sprinkle if necessary and compact that layer, then replace and compact the top layer. In actual practice, as a time saver as well as an economy, the contractors usually were permitted the expediency of using heavier equipment which would compact sufficiently to 12 in. depth or more without removing and replacing 6 in. layers. Rubber-tired, tractor-drawn rollers weighing up to 100 tons, but usually 50 tons or less, were employed for this work. Bros and Porter were among the makes represented. Multi-tired Euclid and other

50-Foot Fill Possible Across Tidal Meadows

★ The high fill, completed to 12-15 ft. above final height, as seen in November





★ Another view of a typical sand drain rig as used by Geo. M. Browster, Koehring 1005 crane with McKiernan-Terry air-driven hammer is driving a 14-in. mandrel pipe

★ 60-hp. steam boiler attached to Manitowoc diesel crane—one variation in sand drain equipment seen. Outfit belongs to Hercules Concrete Pile Co., subcontractor at the Raritan River for Villa Contracting Co.; single acting hammer; D4 Traxcavator loading sand skip

★ "Swamp special" diesel fuel wagon—an Athey truss wheel mounted truck bed, towed by an HD-14 Allis-Chalmers tractor with dozer. Construction Aggregates-Peter Kiewit project



★ On the John Rosenblum, Inc., contract-Tourna dozer used for spreading fill material, pusher service, keeping yard area smooth, etc., etc.

★ One of 400 houses being moved to make way for the Turnpike. Remarkably little removal or wrecking work has been required for the project, considering its length

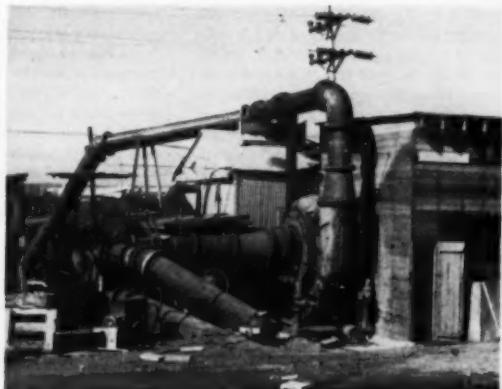
★ Seven-reel grease truck. This de-luxe job, designed for quickly servicing a large fleet of equipment, was found profitable by one Turnpike contractor



★ Dredge and pipe line in ship basin adjacent to the Turnpike location —part of Construction Aggregates-Peter Kiewit job which involves large-scale hydraulic filling



★ Some of the elaborate pressure pipe connections, seen on the hydraulic dredging project. Left: pipe here taken under a local roadway. Right: Building houses twin 1600-hp. electric motors, pump housings being seen outside. Several such installations required for hydraulic filling



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★ Bulldozers begin spreading as hydraulically placed sand accumulates in settling ponds along the highway line



★ Heavy underground utility installations hampered the Turnpike construction in many places. Here is seen a cable and conduit assembly enclosed in a timber box supported on cribbing during excavation





★ On the S. J. Groves & Sons contract—C Roadster Tournapull with E-16 Carry-all Scrapers hauling swamp fill material, with dozer spreading and dragline mucking out at toe.

rock wagons, or scrapers, loaded with sand, also were used.

As the job progressed, a further expedient was sometimes permitted; namely, that of placing a 12 in. layer of sand on the original ground and then securing densification to a depth of 2 ft. down, by means of heavy rollers or loaded construction rigs, loaded to 25,000 lb. per tire. Such digressions from the original specifications were greatest for the pre-compaction work. Thanks to the heavy equipment used, however, adequate densities were obtained in general throughout the Turnpike line, despite the excessively wet season.

2. Embankments. All fill material inside the shoulder lines was required to be better than A6 material (PRA classification). Outside the shoulder lines material of A6 or A7 classification was allowed where better material wasn't easily obtainable.

Except in the tidal meadows at the north end, the terrain through New Jersey proved quite generally underlaid by sandy soil of excellent quality. This single fact has been of priceless value to the Turnpike authorities, since it assured abundant suitable fill material and since sand affords a solid footing and minimum delays during wet weather.

Intermittently throughout the project, however, short muck sections were encountered at creeks, low spots, etc. These areas were excavated and back-filled with granular materials, using the end dumping method up to about water level and compacting in layers whenever feasible. Special emphasis was placed on mucking out ahead of dumping, rather than underwater displacement of muck, since it was found that results from displacement efforts were not always satisfactory. At each site the engineers had to determine how best to achieve a satisfactory roadbed in the shortest time. Test holes made late in the season showed that most muck spots were satisfactorily stabilized. However, some areas were found to have remaining muck

layers. In a few instances fill was removed and rebuilt. At other spots, "controlled" embankment placement was resorted to. Pore pressure gauges were installed in the fill, and further fill material was added at a predetermined rate, to avoid building up excessive pore pressure which would cause lateral displacement. As soon as pressures subsided below the critical point, the contractor was given the green light to build fill as fast as desired. Lateral movement of soil alongside the fills was watched carefully by means of stakes.

Variety Fill Methods

On good ground, embankment construction proceeded by standard methods, the contractors using a variety of equipment. Cuts and fills were shallow in general, and loader-wagon fleets and self-propelled scrapers shared honors for most of the yardage of roadbed excavation.

Rolling specifications for embankment permitted either sheepsfoot rollers or pneumatic tired rollers. Sheepfoot rollers were required to weight, when loaded, not less than 3,000 lb. per linear foot of drum, with not less than 500 psi. on feet 7 sq. in. or larger in area. Minimum weight of 2,500 lb. per foot of width was specified for

pneumatic tired rollers, with 220 psi. minimum per in. of tire width.

In practice, here again the contractors were given the widest possible latitude in accomplishing the required densities. A job rule observed in general was to consider six passes of heavy equipment the equivalent of one passage of a large roller weighing 25,000 lb. on each tire.

The engineers experimented on fill construction with rolling in various layer thicknesses greater than 6 in., but decided usually to adhere to the 6 in. specification with small rollers for best and fastest results all around. Much of the time little or no rolling was necessary on the southern section, since densities could be secured without rolling due to constant passage of heavy construction equipment, the excellent sandy material compacting readily. Contractors, despite their constant missionary work to be allowed to secure compaction in their own way, need to have the method specified to some degree as well as the results, said one engineer; it is difficult to secure cooperation from a contractor's field force, and a basis for positively controlling the quality of the work as it moves along is lacking. In the northern Sections 6 and 7 the specifications require a minimum amount of rolling in addition to the fixed minimum density requirements, which assures uniformly high compaction.

The standard specifications were explicit on details of benching and tying the fill in with the ground. Where the ground sloped greater than 1 on 3, a bench was required to be cut for each 6 in. lift, and the material loosened in cutting the bench thoroughly compacted along with the fill material.

The A and B upper layer of fills have seen greater use of the large supercompactors, these big machines working at their best where the template grade and solid footing have



★ A neat job of batter pile driving for overpass bridge. Laurel Hill, seen in background, was the only spot in 118-mile project requiring rock excavation.

been fairly well established, permitting continuous operation with minimum traction. Smaller pneumatic rollers also were used.

Special subgrade material, Grade B, is placed a minimum of 12 in. deep over all cut or fill area. This consists of material having a P. I. not exceeding 6, so graded that not more than 10% passes a 200-mesh sieve. A CBR of 15% or better is required when compacted at 100% of maximum density.

Special subgrade material, Grade A, next is placed to 16-in. depth. It consists of pervious, free draining, frost resistant material, classified as A3 by the Bureau of Public Roads classification. This material must have a P. I. of not more than 3, with not over 6% passing 200 mesh; CBR of not less than 20% at 100% of maximum density.

During dry weather periods another expedient was found useful, namely that of placing A and B sandy materials in 12 in. lifts instead of the specified thinner layers. This resulted in less aeration and better retention of moisture at or near optimum for rolling.

All references to "maximum density" pertain to AASHO Test T-99-49 modified by increasing the test mold to 6 in. diameter, mold height to 6 in., rammer weight to 10 lb., rammer fall to 18 in., layers of soil per mold to 6, and number of rammer blows to 55. This "modified" density requirement, heretofore most commonly used on airport runway work, means in effect the achievement of densities substantially higher than those represented by the AASHO standard test.

Borrow Was Big Item

Over 21,000,000 cu. yd. of high grade soil or sand is required as borrow items in the various contracts. In their quest for acceptable sources the contractors, prior to bidding as



★ Carrying sand platform out over a marsh area—Allis-Chalmers HD-19 bulldozer spreading; Lorain dragline mucking and rehandling

\$39,500,000 in Pavement and Shoulder Contracts to be Completed in 1951 on New Jersey Turnpike

Contract Number	Awarded to	Amount	Pavement Sq. Yd.	Shoulders Sq. Yd.	Section	Mileage*
59	S. J. Groves and Sons, Inc., Woodbridge, New Jersey	\$6,312,436	721,000	426,000	1	20.4
60	Savin Construction Corp., East Hartford, Connecticut	5,091,044	603,000	323,000	2	18.0
61	Geo. M. Brewster & Sons, Inc., Bogota, New Jersey	5,895,231	699,000	410,000	3	21.0
62	Geo. M. Brewster & Sons, Inc., Bogota, New Jersey	7,086,873	792,000	450,000	4	24.5
63	S. J. Groves & Sons, Inc., Woodbridge, New Jersey	6,296,148	574,000	280,000	5	14.2
64	Gull Contracting Co., Tully and di Napoli Flushing, New York	5,558,791	460,000	196,700	6	10.0
65	Geo. M. Brewster and Sons, Inc., Bogota, New Jersey	3,289,384	275,000	148,000	7	7.4
Totals		\$39,529,907	4,124,000	2,233,000		115.5

*The difference in mileage figures compared with roadway length is made up of over-passes, under-passes, etc.

well as later, turned into prospectors, opening up literally square miles of pit areas for the necessary yardage. Borrow was required to augment balanced cuts and fills on embankment work, and also for the subgrade and base lifts and special zones of sand blanket.

Fortunately the prospectors seldom had far to go. No estimate of the haul distances can be made, but haul

over 5 miles offside the Turnpike were the exception on the southern end. Brewster's work on the north end required perhaps the longest average haul, and he is working a fleet of as high as 100 trucks in transporting 4,000,000 cu. yd. of sand 20 miles or more at times.

One contractor used a truck mounted auger for prospecting. Such devices permitted the taking of frequent samples in determining the suitability of a borrow pit, an important consideration because of the occasional presence of clay lenses.

Various methods of excavating borrow were employed. Eight of the big Euclid loaders saw borrow service at one time or another, along with work in cuts along the grade. Other contractors preferred to load with shovels, since clay spots could be avoided by maneuvering the dipper, or else mixing poor material with good to meet the specifications. Production delays are often minimized by having a man in the pit check each wagon or truck load visually, the good material being routed to the grade and the poor material used when permitted as fill outside the shoulder lines.



★ Safe detours during construction are provided under a carefully devised program of the New Jersey Turnpike Authority to protect and aid the public wherever possible. Here N. J. route S-14 will be cut through for a Turnpike underpass

EDITORIAL

★ Put Your Road Funds to Work

Perhaps the most sensible and workable idea to come out of the highway officials' meeting at Miami early in December, was the one to put all available road construction and maintenance funds to work at the earliest possible moment.

The nation will need a well built and maintained state road network in the coming period, as never before. Nearly every state, county and city has funds lying in wait on the red tape of programming, or for last-minute survey and plan details to be completed. Nearly every agency, likewise, has funds which can be earmarked immediately for heavy repairs. In the national interest these funds must be dusted off and put to work. Contractors with jobs can then make firm commitments for materials and equipment, and road maintenance forces can better keep abreast of the mounting burden they'll soon be facing due to heavy defense traffic and scarcity of materials, labor and equipment.

The spokesman of the "get going now" idea at the AASHO meeting was D. C. Greer, retiring president of the Association and state highway engineer of Texas. Mr. Greer is a man of action. Later, on getting back home, he announced to the newspapers of

Texas that the Texas highway commission is embarking on a special \$7,500,000 program of heavy maintenance on selected routes. This program is planned as "Capital Betterment" on the state system, and is designed to help protect the existing investment in the sections of road covered. Some 3100 miles will be covered in 179 counties, with a high type maintenance to forestall deterioration.

Texas, it will be remembered, was also the state which got rolling perhaps soonest and stayed rolling at one of the highest levels on essential highway projects during the years 1942-45. Its leaders fought for OK's on projects, and got them. In contrast with such states as New York, Texas invested in roads early in the inflation rise, rather than piling up idle road funds, and thus got bargains in construction prices, compared with later prices. Their costs were all the lower because a spirited and cooperative group of highway contractors was kept in good running order; the contractors individually were able to map their private plans for maintaining staff and equipment based on steady work, in the realization that their state's highway department was determined to keep doing a maximum possible job in the public interest.

★ County Highway Problems in a Nutshell

County highway needs and problems in Michigan, and elsewhere for that matter, were well summarized recently in a paper by J. T. Sharpensteen before the annual convention of the Northern Michigan Road Commissioners Association.

Mr. Sharpensteen, who is a veteran road figure and county engineer of Genesee County, Michigan, noted that the most important things to a county are: survival; a source of natural road-building materials; conservation of these materials; management and engineering; and better accounting. He also stressed the importance of standardization of road equipment, particularly trucks.

The Genesee county engineer's statements are thought-stimulating, and we are emboldened to set down several suggestions on these topics made to us recently by other leaders in county highway administration. Some if not all of these may find Mr. Sharpensteen in concurrence.

The question of survival is indeed timely. Section 2 of the Federal-aid Act of 1950, signed by the President September 7, 1950, provides for the establishment of a

secondary road unit in the state highway departments to co-operate with the counties, and for arrangement with county or group units for the construction and maintenance of secondary road projects where adequate engineering personnel, suitable organization and proper equipment are available in a single county or group of counties.

Will Strengthen Counties

These provisions should not only assure survival but should lead to the strengthening of county highway organizations. The provisions of this section closely parallel the objectives of the original Federal-aid Act which required the establishment of an adequate state highway department and provisions for proper maintenance. The high level of development enjoyed by our state highway departments and the quality of their maintenance performance, especially during the war years, attest to the wisdom of this policy.

The availability of natural roadway building materials, which Mr. Sharpensteen also deems important, often determines the standard of original construction

and the intensity of subsequent maintenance. Natural deposits should not be exploited or wasted. The annual loss of one-third to one-half inch depth per year of selected surfacing material will require the replacement of approximately 100,000,000 cubic yards on the existing million miles of soil-aggregate roads at a cost of approximately \$200,000,000 per annum. This is a large part of our annual maintenance outlay for local roads and it will increase as natural deposits are depleted.

Counties Need Engineers

Because the development of the primary and express highways often precedes local highway improvement there is always the chance that the lion's share of local road-building materials will be drained off by this arterial highway construction. Local highway officials in New Jersey are already concerned over the prospects of greatly increased surface replacement costs as the result of aggregate depletion resulting from the Throughway and Turnpike construction. In most instances the longer material haul can be better financed for the super highway. Good local highway management should provide for the local ownership of natural road-building material deposits for long-range local highway construction and maintenance needs. Good managerial judgment also calls for appropriate measures to conserve these resources. Studies in Iowa reveal that the annual loss of granular type surfaces can be cut in half by adding and mixing moderate amounts of binding clays.

Another of Mr. Sharpensteen's topics, the economics of having an engineer-managed county highway department, is a well-established fact. Surprisingly enough, less than one-third of the Nation's counties enjoy the services of an elected or appointed engineer. Undoubtedly, the prevailing salaries, which do not provide remuneration in proportion to the responsibilities assumed by a county engineer, contribute to the present situation. Salaries, while improved to a considerable extent in recent years, are still relatively low compared with salaries for comparable work in state highway departments and private industry.

The expenditures for highway construction and maintenance in some counties will approach or exceed a million dollars annually. It would be revealing to make a comparison between the salaries paid a county engineer, responsible for such an outlay of public funds, and the manager of a million-dollar business in private industry. The laws of Ohio not only require registered professional engineers for its county highway supervisors but also provide for a minimum salary in extremely rural counties and suitable increments for increased job loads in the higher developed counties.

Supervisors Lack Authority

The maximum benefit of existing technical supervision and the experience of practical highway superintendents often cannot be realized because full managerial responsibility is not delegated. For example, some county governing bodies insist on exercising full control over the purchase and disposal of equipment, even

when the county highway operations are in charge of a well-qualified technical supervisor. No one picks the tools for a specialist in any other profession! The county engineer, as equipment fleet manager, should be able to replace worn and obsolete equipment automatically from a continuing cash sinking fund accumulated from rental earnings. County boards which function solely as planning and policy-making bodies in highway matters give the greatest service to their constituents.

Again, as Mr. Sharpensteen points out, there is also an urgent need for improved cost accounting. Many county and local highway departments are unable to arrive at an accurate breakdown between construction and maintenance expenditures, much less to determine desirable quantitative and operational costs. This situation exists because few of these highway organizations have adopted the business-like "rental rate" system for charging for equipment services, and because the belief persists that a corps of clerks would be required for any cost-accounting system. A number of progressive counties, by introducing simple field records and combining the cost accounting with payrolling, have managed to produce acceptable cost records without adding to their clerical staffs. In any event the addition of a single cost-accounting clerk is more than justified when the annual outlay for county highway purposes exceeds \$200,000.

It is quite possible that the last problem posed by Mr. Sharpensteen, the standardization of highway equipment, can be achieved more readily at county level than at state level under existing laws. The method of purchasing highway equipment by New York counties should be explored by counties in other states. This procedure provides for the purchase of equipment on the basis of field performance and other factors, rather than solely on the low-bid principle.

In This Issue

In this issue is an article telling of the work of a man who is the oldest, in point of continuous tenure, of any county road supervisor in Indiana today. He happens not to be a college-trained engineer, but has studied and developed into an excellent practical engineer, along with being a good manager and a good spokesman for highway needs in his county. His accomplishments were made possible because his commissioners have had the wisdom to let a good man alone, give him a chance to make a satisfying career, and to share the political credit for the good job he is doing.

Military and defense urgency has become the uppermost consideration in all road programming and planning today, affecting the work of engineers and contractors alike. See elsewhere in this issue how the subject of roads vs. the preparedness program was ably highlighted at the recent AASHO meeting at Miami.

IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS



How to Cut Your Earthmoving and Construction Costs

"Brush up" course for superintendents, foremen, operators—and owners—all of whom can benefit by an occasional review of the fundamentals. How many of these common sense rules are your men observing?

By LeTourneau Field Engineers

Part 1—Job Planning and Layout

CONTRACTORS are striving constantly for ways and means of reducing costs of construction, and equipment operators can do much to help make this reduction possible.

By thoroughly understanding earthmoving methods and practices, and by employing short cuts and improvements in operation and aid in keeping equipment operating at its peak productive capacity, operators will help both the contractor and themselves. How?

They will help keep the contractor in business by combatting the high costs of materials, equipment and labor, which will give the contractor a better chance in competitive bidding. This, in turn, will benefit the operator by maintaining his own job security and continued high earnings.

Job Planning. Since the earthmoving contractor's major investment is the equipment on the job, its performance and efficiency naturally are of greatest concern.

With this in mind then, let's talk about procedures and principles to see what can be done to keep earthmoving equipment working efficiently and effectively.

The success of any earthmoving project is dependent upon job planning, job layout and supervision. It is essential that there be a thorough knowledge and understanding of the job in question. Study of plans and specifications must be made to determine equipment schedules, time and progress schedules and job pro-

cedures. For large-scale operations, the economy and advisability of having standby units for continuous production must be considered.

Training Yourself. Equipment should not go to work on an earthmoving project until there is a definite plan in mind for its operation. But the best plan formulated by the contractor and his superintendent cannot succeed without the skill and co-operation of foremen and operators.

It pays to observe. Watch the other operators and see how they handle their rigs. Do they get the maximum production from their Tournapulls in the easiest way on themselves and their equipment? Inefficient operation tires the operator; results in decreased production, increased machine maintenance, higher costs. The operator can reduce machine "downtime" by knowing and observing manufacturer's operating instructions and preventive maintenance procedures.

See to it that the rig you operate is in top mechanical condition at all times.

Tell job maintenance men and mechanics of minor irregularities of machine performance before they develop into major repair projects. Care for your machine as if it were your own.

● *Equipment is a contractor's major investment on a job. Proper job planning, job layout and supervision keep it working efficiently and effectively.*

Earthmoving Cycle. Common practice is to balance the earthmoving cycle by hauling in both directions. This reduces time lost in turning and increases production. The practice is particularly valuable when short hauls are necessary, or when working equipment in rolling country.

The diagrams shown here present the more common combinations of a series of balances which may be handled together. In most instances the superintendent or grade foreman will lay out procedures to follow, but there will be times when they aren't present or the operator may be sent out alone to do a small job.

Example B. For example, recently one operator was sent out on a small project which he laid out to resemble diagram "B". On this job, the fill area was located between two hills 1400 ft. apart—600 ft. from one cut and 800 ft. from another. Using a D Roadster Tournapull with E9 Carryall, he self-loaded on one hill with red clay, mica and decomposed granite, hauled the material to and spread it upon the fill, traveled up an 8% grade on the opposite hill, self-loaded, returned and spread upon the fill, and returned to the first hill in loading position in an average of four minutes. Hourly production was high—147 pay yards per hour.

Borrow Cycle. An operator can do much to improve borrow pit operation. Borrow or excavation areas should be formed to make possible fast operation of rubber-tired prime-movers and scrapers.

Spot your scrapers within the borrow areas so they may be kept level or slightly downgrade in the direction of loading.

Floors should be well-drained, free of ruts, holes and unnecessary grades which hinder operating speeds.

If patrol graders aren't available for this work, use your scraper to do

the jobs while waiting for pusher assistance.

Leave the pit for the haul road on as little grade as possible.

Part 2—Loading Cycle

Scrapers perform three major functions; that of loading the material, transporting it, and spreading it upon the fill.

Production with these units is measured by the size of the load and the time required to complete a cycle of load, haul, spread and return.

A maximum load in the minimum time will give peak performance. Cycle times can be reduced by good haul roads, easy grades and curves, traffic regulation and good underfoot conditions, or low rolling resistance, as the engineers would say it.

Heaped loads should be obtained in one minute or less in distances up to 100 ft. Team up, or synchronize, the pusher and scraper to eliminate waiting time. Here's how:

Space machines to enter the pit or borrow area at 1½- to 2-minute intervals. This keeps the pusher tractor working efficiently and avoids unnecessary scraper delays.

Avoid lost time. It is not uncommon to see a pusher track backing up or turning around in order to get to the scraper. A backward movement of one scraper length can add up to 0.5 min. to your load time.

Case A. Pusher chain or shuttle loadings, as in Figure A, reduce travel time and maneuvering in the pit. Step pushing can be used where conditions warrant such operation. This allows the pusher to serve more units and eliminates non-productive return time.

If this method is not being used and scrapers tend to bunch up, follow along beside the pusher, cut in front when the loaded scraper leaves and then start to pick up your load. If the haul isn't long and other units are waiting, it may be well to forget about packing in that last yard. Get what you can and run. The extra yard you gain will not offset the additional yardage that can be obtained by the waiting units.

Cycle Comparison, Pusher Loading Methods for Self-Propelled, 13.5-Cu. Yd. Scrapers

Fixed Time:	Step Pusher	Conventional Method
Average time to position and load	1.0 Min.	1.5 Min.
Average spread time	.5	.5
Average time for acceleration and turns	1.0	1.9
Total fixed time	2.5 Min.	3.0 Min.
Haul time	1.5	1.5
Total cycle time	4.0 Min.	4.5 Min.
Trips per 50-minute hour	12.5 Trips	11 Trips
Pay yards per trip	11	11
Pay yards per hour	137	121
Units one pusher can serve	4	3

Load downgrade, as in Figure B, to give increase scraper yardage. Let gravity give an additional boost to loading. Use it to get capacity loads for both pusher loading and self-loading.

Case C. Try another time saver—straddle loading (Figure C)—doubly valuable when self-loading. Space first and second loads four feet to six feet apart. This leaves a partially loosened, easily-loaded ridge for the third load.

Experience has shown that a pusher tractor with sufficient power must be used to gain capacity loads in the time and distance indicated. Too small a pusher results in too-lengthy load times and distances.

High-speed pushers cut positioning time behind scrapers in the borrow area, give faster heaped loads and reduce the number of pushers required to serve a scraper fleet. Rubber-tired dozers may save as much as 0.4 min. per load.

Rubber-tired type
Dozer Dozer

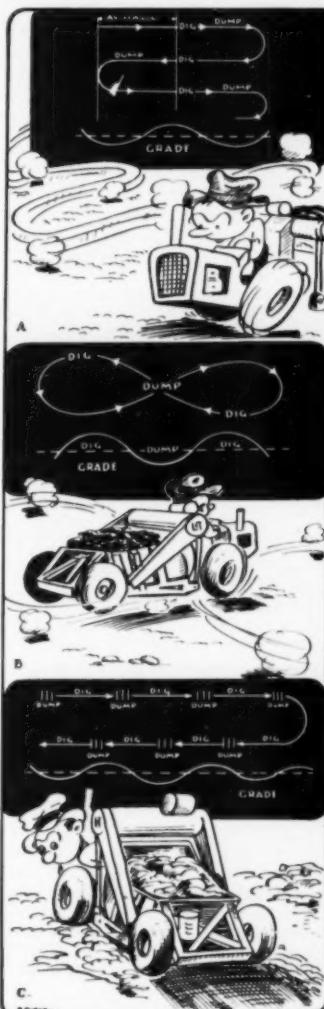
If pusher cycle is 1.5 Min.
And scraper cycle is 9.0 Min.
Then each dozer can handle 6 scrapers

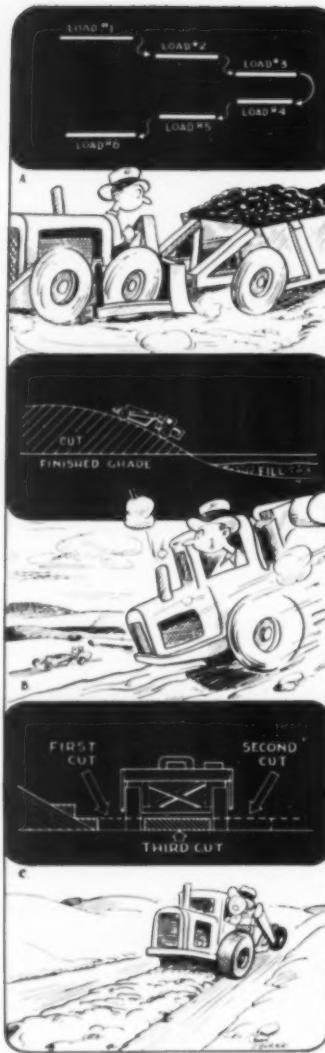
1.9 Min.
9.0 Min.
4 scrapers

travel in areas that have been rooted. Such areas reduce your travel speed, and the wheels re-compact the rooted material.

Part 3—Hauling and Spreading

Try to cut travel time to a minimum. Many small savings in time multiplied throughout the duration of the job makes a difference in the total production and the time required to complete the job. To secure maximum production from high speed scrapers, keep away from lower speed hauling units if at all possible. No hauling unit can travel faster than the unit ahead of it and unless there is ample safe passing space it is sometimes difficult or impossible to pass. For top





tion, increase safety and reduce driver fatigue.

A well-maintained road (Photo A) reduces rolling resistance. Surprising differences in haul speeds and production can result from rebuilding a soft, uneven, rutted road into one of firm, hard smoothness.

*Typical Rolling Resistances
in Pounds per Gross Tons*

Smooth road, no penetration	40#
Well-maintained construction road	65#
Average construction roadway	100#
Moist sand	200#
Dry sand	300#

Table of Usable Rimpulls

1st Gear—useable rimpull	16,400#
2nd Gear—useable rimpull	7,800#
3rd Gear—useable rimpull	4,450#
4th Gear—useable rimpull	2,460#
5th Gear—useable rimpull	1,600#

Example: Here is an example of what a big difference a good road can make on production. Say for instance, we have a scraper weighing 32,200 lb. with a load of dirt weighing 32,000 lb. This gives us a total weight for the scraper and load of 64,200 lb. or 32.1 tons. One road we will use as an example gives 150 lb. per gross ton of rolling resistance. To find the rimpull required to overcome the rolling resistance we multiply the scraper weight of 32.1 tons by the 150 lb. per ton rolling resistance.

$$32.1 \text{ tons} \times 150 \text{ lb./ton} = 4815 \text{ lb. rimpull}$$

Referring to the chart below we find that to obtain 4815 lb. of rimpull we must travel in 2nd gear. (If the rimpull falls between two gears, the lower gear must be used.)

Take the same 32.1 ton machine over a hard, smooth roadbed with 40 lb. per ton rolling resistance and it is necessary to have only 1284 lb. of rimpull.

$$32.1 \text{ tons} \times 40 \text{ lb./ton} = 1284 \text{ lb. rimpull}$$

Again referring to our rimpull chart we see that on such a road our machine could travel in 5th gear.

The difference between 2nd and 5th gear on one machine in the LeTourneau line is the difference between 7.25 and 35.03 mph. Ability to travel at top speed could mean the difference between profit and loss on a job.

Avoid Grades. Good alignment and flat grades should be maintained wherever possible. Grades affect earthmoving efficiency (Photo B). Excessive grades require greater rimpull and a lower gear of travel, both of which result in a lower average travel speed. Each one per cent of adverse haul grade consumes approximately 20 pounds per gross ton of rimpull. For highest production, cut grades down as much as possible.

Here's an example of how adverse grades can affect earthmoving production. Suppose we take the same 32.1 ton scraper used in the last example and figure the rimpull needed to climb both a 10% and a 4% grade. We multiply 20 lb. per ton times 10% grade times 32.1 tons to find the required rimpull.

$$20 \text{ lb./ton} \times 10\% \times 32.1 \text{ tons} = 3210 \text{ lb.}$$

Referring to our rimpull chart we find we would have to travel up the 10% grade in 3rd gear.

On a 4% grade we need only multiply 20 lb. per ton times 4% grade times 32.1 tons.

$$20 \text{ lb./ton} \times 4\% \times 32.1 \text{ tons} = 1284 \text{ lb.}$$

The chart tells us that we could travel up a 4% grade in 5th gear, or two gears faster than up a 10% grade. (Note: In this example, in order to avoid confusion, roadway rolling resistance has not been considered.)

Cut Down Grades. If the yardage warrants, it may be profitable to cut down the grade to permit traveling in a higher gear and thus reduce cycle time.

Sprinkler wagons keep down dust. Good visibility reduces accidents and equipment maintenance and makes high travel speeds possible.

Use full power for quick acceleration.



★ Use your pusher tractor so that back-ups and turn-arounds are unnecessary

tion and higher average speed on long hauls. Make the most out of the speed for which the machine is designed.

Spreading. Observe the spreading portion of the earthmoving cycle. In practically all scraper operations, the material is spread in even layers of varying depths. To secure the most efficient operation, check up to make sure that the following practices are being followed.

Assure that all loads are spread in a gear corresponding to the flowing or spreading properties of the materials. Some materials, if not properly ejected, increase the rolling resistance of the fill and tend to create a rough fill, thus necessitating a reduced travel speed. For example, too high a speed in spreading certain clays will give spotty spreads and uneven fills. If sand is spread at too slow a speed, it builds up in front of the scraper blade, reducing the travel speed.

Try to keep the spread time within the limits of .5 min. or less.

Limit the spread distance to 100 ft. or less. Most materials can be spread in a distance of 65 ft. to 100 ft.

Leave Fill Quickly. Leave the fill as quickly as possible by the shortest route. Reach the haul road as fast as possible as on the haul road you can get in higher gear and cut your travel time to a minimum.

No attempt has been made to cover all of the elements of proper operation. Following the points that have been made, however, will help you get more production from your earthmoving equipment.

Winter Road Upkeep Problems of A Suburban County

By Earl Dickerson

Superintendent, Orange County Highway Department, Goshen, New York

Because of Orange County's proximity to New York City, commuter traffic and truck traffic carrying farm products to New York have been increasing steadily in recent years, not only on the main State routes but also on the secondary roads leading into main routes. With this increase in traffic has come increased demands by the traveling public for more extensive snow and ice control during the winter months.

In addition to the 150 miles of County Roads, Orange County, by agreement with the State Department, is responsible for snow and ice control on all of the 336 miles of State Highways in the County with the exception of 36 miles taken care of directly by the State. Equipment nor-



★ Photo A—See accompanying article



★ Photo B—See accompanying article

mally used for snow work includes 12 County-owned FWD trucks equipped with plows, wings and underscrapers, 3 County-owned graders with V-plows and wings and 65 privately owned trucks equipped with plows. In addition, there are kept available for use if and when required, 2 Sno-go's, 3 Linn tractors with Rotary type V-plows, one old Holt tractor and one D-7 Caterpillar bulldozer. Approximately 100,000 feet of snow fence is erected each year for the control of drifts.

Except for the 1944-45 season and to some extent the 1947-48 season when we had some quite heavy snow storms, the conditions encountered in Orange County are largely those resulting from ice, sleet and light snow storms causing ice formation on the pavements. During most of the light snow storms of from one to three inches, the volume of traffic packs the snow so quickly that often little can be accomplished by plowing and the problem becomes one of ice control.

Our experience with abrasives has indicated that the effectiveness of the sand varies considerably with the amount of chemicals used. The one bag of salt per cubic yard of sand used to prevent freezing in the stock piles, is not sufficient to make the sand

effective as an abrasive in cases where the temperature remains below freezing and the traffic and wind tend to blow the sand from the pavement. On the other hand larger quantities of salt mixed with the sand increase its effectiveness considerably.

We have used pure salt spread on the pavement to some extent and found it to be very effective, particularly when used early in the storm before any thickness of ice has built up. However, the cost of this operation would be prohibitive for general use on all highways.

A ton-mile tax on trucks and repeal of farmers' exemption from the state gasoline tax on fuel used in farm vehicles may be proposed in Nebraska to replace highway revenues lost as the result of referendum repeal of the 1949 road money laws.

Toll road developments continue to provide news. With the new 100-mile eastern extension of the Pennsylvania Turnpike now open to traffic, plans have been announced for a 40-mile addition which would link that famed facility with a New Jersey cross-state toll superhighway now under construction.



Before

An example of luxuriant sod which has raised well above the pavement. Maintenance crew was busy cutting away sod on other side of road as this photo was taken [Photos by Roads and Streets]



High Shoulders

What Middlewestern State Highway Departments are Doing About Them

I—In Illinois, shoulder trimming is dovetailed with other maintenance, using loaders and trucks

By C. W. Ross

Engineer of Maintenance, Illinois Division of
Highways, Springfield

CUTTING down of high shoulders and cleaning of ditches are major tasks of the maintenance forces of the Illinois division of highways.

The principal object of this work is to restore drainage. Water impounded on the pavement by high shoulders is annoying and hazardous to traffic. It also causes shoulders and subgrades to become saturated and consequently lose supporting power. When the original cross section of the road is restored, water can again drain quickly to side ditches.

Why Objectionable

The objections to high shoulders are rather obvious to anyone who is maintenance-minded but others some-

times question the necessity of removing them. We dislike to destroy any well-established sod and we know that for a period following grade operations the bare shoulders, when wet, may present a traffic hazard and create other maintenance problems such as erosion control, growth of a new sod, etc. We believe, however, that these temporary disadvantages are more than offset by the good accomplished.

High shoulders are found principally in flat, fertile areas and at the base of long grades. They are common in nearly all cuts. In most cases, ditches are filled wherever shoulders are high. When cutting high shoulders on fills, the excess dirt can usually be wasted over the fill. The job is then simple and involves only grading and possibly some hand dressing. In most cases the excess dirt must be picked up and hauled away.

Self propelled loaders of several makes are used for loading excess dirt. Trucks are loaded from windrows of earth thrown up by motor graders. In so far as practical, windrows are made on the shoulders. Since the loaders straddle the windrows and load into trucks at the rear, two-way traffic can be maintained when loading from the shoulders. However, trucks are continually pulling off and onto the pavement so that traffic in effect is limited to one lane and flagmen are employed to direct traffic. Windrows are generally cleaned up at the end of the day's work but, if not, remaining windrows are graded out to the outer edge of the shoulders.

The capacity of all loaders used is, in most cases, greater than the amount of materials which can be windrowed by one motor grader or which can be hauled away by the number of trucks available. Consequently, the loader may be idle at times. Even so, high-speed loading is desirable so that all trucks on the

job will be kept moving. It is preferable that the loader be idle rather than to have the grader and a number of trucks waiting.

Farmers Want Spoil

Availability of sites for wasting dirt has a very direct bearing on cost and amount of dirt loaded. If fill material is not needed on the highway, excess dirt is wasted at the nearest available site. Many farmers solicit the waste dirt for fill in their barn yards and for low areas in their fields. Usually the waste dirt is good top soil which has been eroded by wind or water from adjacent land. It is often in considerable demand. The owner of the frontage where the grader is working is given first choice. Sometimes farmers or other parties place their own trucks under the loader and haul the dirt to places where they can use it but which are beyond the available sites to which State trucks are hauling.



Whenever the fill is needed on the highway, waste dirt from grading is used provided the length of haul is not greater than the cost of similar material obtained elsewhere. This



After

A section of Illinois road following re-cross-sectioning, but before new grass has developed. Erosion at this stage is a temporary problem

have been covered with sod from grading jobs in the spring or early summer. The sod was spread roughly with pitch forks and continued to grow in its new location. If right-of-way widths permit, fill slopes are sometimes flattened out enough to permit removal of guard fence.

As to rate of progress and unit costs of shoulder reduction, it is impractical to quote specific figures since earth quantities vary widely per station or per mile due to the cross

section, especially on the older roads. Working schedules and organizations are frequently determined by press of other work and are usually limited to the time and equipment which can be spared from work of a more pressing nature.

However, some general production figures can be given. A truck is loaded in about 2 minutes. On the average job, 75 cubic yards are loaded per hour. On larger jobs which are well organized and equipped, 100 to 115 cubic yards are loaded per hour. In general, the work is not started unless enough equipment is available to move at least 125 truck loads per day. The mechanical loader has facilitated and expedited the removal of high shoulders and cleaning of ditches where all dirt is excess and must be loaded and hauled away. If we had to depend on hand loading we would be unable to undertake this work on any scale large enough to do much good.

Some Work Contracted

During the war years some work of this kind was done by contract. On roads where continuous grading



★ The first step is to clean out the ditch. This tractor and pulgrader open up a work section just ahead of the loader

★ Loader removing loosened sod and excess shoulder material. Effingham district, Illinois division of highways

sometimes permits doing one job more or less as a side issue to another. For example, the shoulders on a pavement near the Illinois River were composed principally of blow sand and were subject to constant wind and water erosion. Waste dirt from nearby grading job was spread on the sand shoulders and held the sand in place. It will soon grow protection vegetation. Bare flat slopes





★ Indiana state highway outfit working along U.S. 30 during 1950 season. The two scenes show how waiting trucks are kept spotted in a line well outside the loader path, so that the loaded truck has a clear path to pull away in a straight line, get on the



pavement and move on with minimum time, while the next truck has already begun to back "S" fashion to the loader belt. Wide shoulders here permitted this time-saving refinement in operation

is necessary and large yardage is involved, contract grading is desirable in spite of difficulties in setting up and determining quantities and standards. Most of the work done by maintenance is intermittent and usually for the purpose of correcting specific conditions, and is of a nature which does not readily lend to contract.

Each of the ten Illinois state highway districts has one or more units which work more or less steadily from late spring to early fall. A unit consists of a motor grader, mechanical loader and 3 to 10 trucks. The work is mostly mechanical. Labor, other than operators, consists of a flagman and several men to dress up areas where dirt is wasted and to clean around the ends of culverts. Pipe entrance culverts are often re-

moved just in advance of the grading and replaced after the ditch is reshaped. Occasionally a unit works continuously on one route and reshapes possibly 20 miles in a season. The total of all intermittent grading may total 200 to 300 miles per year.

Excess dirt may vary from 1,500 to 4,000 cubic yards per mile, depending on width of shoulders, amount of backsloping done, etc. On light grading a unit may complete one-half to one mile of shoulder per day. The average daily accomplishment is less, due to interruption by rain, necessity of diverting equipment to other work, inability of the grader to keep ahead, etc. Since trucks are mostly recruited from nearby units they can readily be borrowed when grading is interrupted.

II—The Indiana highway commission covered 836 miles of road in past two years, using crews which specialize in this work during the Summer and Early Fall.

By Earl B. Lockridge

Superintendent of Maintenance, State Highway Commission of Indiana, Indianapolis

OUR present Highway Commission and staff in Indiana, and those of us connected with maintenance problems, have recognized the need for widespread shoulder correction along arterial roads. The Commission acquired seven power windrow belt-type loaders to be used almost exclusively for the loading of sod and earth cut down from high shoulders. Naturally, this is not enough equipment to accomplish necessary work in any one season, and at present rate we will be several years accomplishing the full purposes of this program.

The accompanying table shows the mileage we have been able to cover

in two years—837 miles of roadway.

From a check of the costs in four sub-districts, representing approximately one hundred miles of high shoulders and ditches cut and re-

Indiana's Progress in Cutting and Reshaping High Shoulders and Ditches

	1949	1950	Total Miles
Crawfordsville District	50.1	103.3	153.4
Fort Wayne District	22.3	28.4	50.7
Greenfield District	93.0	50.0	143.0
La Porte District	17.9	59.6	77.5
Seymour District	96.9	99.5	196.4
Vincennes District	111.6	104.2	215.8
Total	391.8	445.0	836.8

shaped, the following average costs and data were revealed:

Average rate of progress, 0.85 miles per day.

Estimated average material moved per mile, 275 cu. yd.

Average cost per mile labor plus equipment charge, \$261.70.

Naturally, local conditions will cause the rate of progress and cost per mile to vary considerably in this type of work.

Equipment Needs

In general, the following equipment is used in each outfit.

1 heavy duty motor grader used to cut the shoulder and windrow the material along the edge of the pavement.

1 loader to pick up and load the windrow material.

4 to 12 dump trucks, depending on their size and length of haul for disposal of material.

Much of the material picked up from road shoulders is used in widening narrow fills. Where there is not a suitable place to use the gathered-up sod and earth, it is wasted locally, frequently to fill up the low spots in adjoining fields.

Except on sharp curves, the shoulders are cut to transverse slope at the rate of 1 inch per foot from the edge of pavement.

Where it is found necessary to reshape and renovate the side ditches it is usually desirable to have as additional equipment one crawler type tractor and one heavy pull-type grader to perform this work. Material from the ditches is removed from the high shoulders.

It is the intent of our maintenance department to continue with this type of work until all the high shoulders are cut and ditches reshaped in the entire State system.

Highway Officials

Spotlight Role of Highway Transportation in Nation's Defense Program

State highway departments urged by AASHO leaders to place all available funds under construction at earliest moment, as means of best serving nation during rearming program.

CRIPPLED with inadequate financing and the lack of working time since the end of World War II, America's road builders face a seemingly overwhelming task with another war or defense preparation period on the horizon.

This blunt appraisal of the nation's highway situation featured the presidential address of Dewitt C. Greer, state highway engineer of Texas, before the American Association of State Highway Officials at their recent annual convention. Held Dec. 4-7 at Miami, Florida, the AASHO meeting drew over 1600 delegates and visitors.

Mr. Greer said that highway officials must join in meeting new war-born issues squarely, "waging as good a fight as we know how," accepting the inevitable with grace and dignity, and devoting all possible effort to finding ways to operate under the new conditions. He reviews recent federal highway legislation, saying that while all engineers agree that federal aid is inadequate, state highway engineers can be on the alert for leaks and dispersions in state road funds, such as underweight registration of trucks, illegal claims for gas tax refunds, abuse of motor vehicle reciprocity, etc. "With the lack of funds, and with war looming," further noted Greer, "we should move expeditiously by placing new primary federal aid funds on our existing primary federal aid highway system in a manner to provide for the reasonably safe and adequate movement of traffic, but particularly for the protection of the existing investment." He suggested that each state immediately analyze the condition of the primary system roads and recommend a priority program to the Bureau of Public Roads, with at least 40% and as high as 60% of the proposed expenditure aimed at "Capital Betterments" or "Protection of Investments." The remaining funds should be utilized to push forward some of our more advanced designs, on new locations and new right of way, which will be far from enough to even make a dent in the needs but will provide

some engineering advancement.

Thos. H. MacDonald, Commissioner of Public Roads, outlined the great post-war development of highway transportation, the essential importance of this traffic, and the need for roads in a defense period. This country's transportation of food and materials is now predicated upon widespread use of highway transportation, noted the Commissioner. Vast fleets of trucks and buses transport our food, our supplies, our equipment, our people, rapidly and economically.

Highway's Essential Role

The nation's defense must be built around a fast-moving, hard hitting military force backed by a powerful civilian defense. Our military forces are highly mechanized, using trucks, tractors, jeeps and other automotive equipment.

Following notes cover some of the papers and meeting sessions.

Radiotelephone. Today 68 state, county and city highway departments use radio to manage their operations, noted a report by H. A. Radzikowski, committee secretary, to the Association's committee on use of radio. Forty of these agencies cover a combined area of 709,000 sq. mi. and 129,000 miles of highway with radio equipment.

The committee's report presented details of several case studies on radio

use. While originally confined to snow removal work, radio now is a year-around aid in all phases of highway department operation. (A more detailed report on radio in a future issue of *R. & S.*—Editor).

The inclusion of secondary roads in the federal-aid program by the last federal highway acts of Congress, has helped foster a greater attention nationally to the problem of county and local highway development generally. One of the most energetic and ably managed committees in the national highway field today is the Committee on Design, Construction and Maintenance of Secondary Roads, of the American Association of State Highway Officials. The committee is headed by R. A. Harris, chief engineer of the Mississippi state highway department. A. C. Leonard, who is chief, secondary roads branch, Public Roads Administration, is the committee's secretary.

Secondary Road Problems

In an all-day session at the AASHO convention in Miami, in December, this committee reviewed many problems and discussed future courses of action. It has done a great deal of preliminary work in studying data from local road inventories now received from 22 states. A conclusion after studying this grist of data is that the pioneers often were amazingly clairvoyant in the wisdom they showed in obtaining wide rights of way, good road location, and other matters. Their best thinking compares with the best thoughts of today in many areas.



President-elect J. A. Anderson, Virginia



Vice-pres.-elect B. D. Tallamy, New York

Resolutions from Miami Meeting

Highways are not expendable. Government and military leaders should keep this fact in mind, in view of the national dependence on highway transportation. Road construction and maintenance must be accelerated.

Services of state highway departments are offered to help channel the requisite materials into the highway program.

The Interstate System of main highways is endorsed as being in need of the most urgent construction effort.

Highway safety requires a high level of highway construction volume. The objectives of the action committee of the President's Highway Safety Conference must be constantly furthered.

Continue the research into the effect of heavy truck load repetitions on highway pavements.

Appreciation is expressed over the action of the Office of the Secretary of Defense to establish highway transportation policies related to size and weight limitations of motor vehicles carrying military cargo.

The greatest obstacle to highly efficient administration of secondary and other roads at the county level, usually is the archaic form of the county government, the committee leaders conclude. Local prerogatives, long established, are difficult to change. The committee, seeing that little change can be hoped for soon in this quarter, plans to concentrate on one avenue of development that holds good promise. That is the more widespread employment of engineers or highly qualified practical superintendents. If county boards can see their way to separate policy functions from operating and engineering functions, and to center the latter functions in a qualified engineer with freedom to act, the nation can expect to see great strides in local highway management.

The committee therefore has as one of its objectives to review state, county and local road design and construction techniques, with the aim of developing more scientific means of producing low-cost roads. As it is today, the technology of low cost roadbuilding is highly developed, but is often being applied in poor or hit-and-miss fashion by the counties, to

the detriment of local taxpayers and road users.

The delegates present, comprising state and federal engineers, agreed that the county is the proper government unit to administer federal-aid secondary roads. A county commission consisting of three to five members, elected at large and serving overlapping terms, was recommended as the most effective form for efficient county road administration. This would mean a reduction of the nation's county board members from 21,000 down to 9,000.

County Needs Engineer

Also recommended, as a general guide, was the policy of having an engineer appointed by the board for a term of four years, subject to removal for cause only. The engineer would prepare road construction and maintenance budgets, subject to approval by the board, but to be carried out by the engineer.

Suggested qualifications of a county highway superintendent were talked over. An Illinois delegate cited his state's laws, enacted in 1914, which have worked out well. They require that a county highway superintendent be either a graduate civil engineer with 2 years of experience, or an engineer with 10 years' experience in absence of degree, or a practical man with 15 years' practical experience. He must pass an examination given by the Illinois division of highways, after which he is certified as to eligibility for appointment by the county highway board.

As a result of this law, over 50% of the 102 county highway superintendents in Illinois are graduate engineers, 80% or more combine practical and engineering qualifications, and about 10% are practical men only (not able to make surveys and plans). The state's county highway men are of high quality on the average. They serve a 6-year term, and are removable only for cause.

The committee will continue the study of avenues of inter-governmental aid, such as are increasingly needed. These include, for example, the practice of state highway departments offering the counties specialized services on soils engineering, bridge design, street signing, planning, etc.—services which call for a wider and more special experience than can usually be rendered properly by the busy county engineer and his small staff. State highway departments were counseled to take a closer and more sympathetic interest in the county road problems.

Differences in opinion on what should constitute the proper stand-

ard of secondary highway design, came in for discussion. It was pointed out that these differences are more frequently found between state and county engineers, than between federal and other agencies, although the Bureau of Public Roads usually gets the blame where "too high" standards are adopted. The BPR, said an unofficial spokesman, doesn't mean to encourage the states to insist on too high standards, but rather would like to see sectional or regional needs met realistically, judging each highway project on its own.

Other miscellaneous points covered:

Consulting engineers sometimes fill a useful role in counties not able to hire a full time engineer, noted one spokesman, this view being contrary to the Public Roads policy of discouraging consulting work on secondary F. A. projects.

County or secondary road liaison men appointed in the state highway departments should be top-quality men.

In considering the road needs, the problem in every state is to consider the whole highway transportation needs of that state, and seek balanced development of all classes of roads.

County, state and federal highway engineers must do a broad, constructive job in administering the present

AASHO-AGC Committee Suggests Action

Awareness of the need for swift changes in highway policy and procedure was shown in a statement issued at Miami, following a meeting of the AASHO-AGC joint cooperative committee. This committee suggested that, regardless of war or peace, a 10-year program of continuing highway work be laid out. Highway departments are urged to make all possible awards as soon as possible, so that contractors can make firm commitments for materials and equipment.

Payment to contractors for materials as delivered, is sought.

Return to simplified alternate designs is suggested, as a means of conserving critical materials and removing obstacles to progress with vital projects.

The U.S. Bureau of Public Roads was favored as the acting claimant agency for priority materials, in the event of an allocation program, rather than to have some agency step in which is not familiar with highway requirements.

Also sought is a termination clause for road contracts, in event of war, in the belief that such a clause would encourage contractors to tender lower bids.

federal-aid secondary road provisions, or else the next Congress may go farther afield in the direction of practices which highway leaders consider unsound.

A sub-committee on administrative techniques of the secondary road committee, reported certain notable conclusions or recommendations. The average F. A. secondary project over the U. S. costs about \$400 per mile for engineering, representing from 2% to 12% of the total construction cost. Ways of reducing this cost should be explored, with simpler plans urged.

In some areas objection has been raised on the elapsed time required between F. A. secondary program submission and contract award. This time averages 6½ months in Kansas, a year to 15 months on some projects in other states. Reduction of red tape is sought, including quick approval of plans by district offices of the BPR. This sub-committee also suggests that Route Reports be eliminated or simplified—these reports, required by the BPR, being a hangover from pioneer days and no longer needed.

Maintenance Committee Meeting

The AASHO committee on maintenance and equipment, R. H. Baldock, chairman, and the committee on Research Activities, H. F. Clemmer, chairman, held an all-day session which covered many topics. Following are some of the points brought out in discussion.

Snow Equipment. Different states have varying preference for motor grader mounted or truck mounted rotary plows, Colorado being an advocate of mounting both displacement and rotary plows on graders.

Anderson of Virginia Heads AASHO for '51

President: J. A. Anderson, commissioner of highways, Virginia.

1st Vice-President: B. D. Tallamy, superintendent of public works, New York.

Regional Vice-Presidents: R. F. Smock, Pennsylvania; A. E. Johnson, Arkansas; T. J. Kauer, Ohio; J. R. Bromley, Wyoming.

Executive Committee: R. H. Baldock, Ore.; D. C. Greer, Texas; S. C. Hadden, Indiana; R. A. Harris, Miss.; M. J. Hoffman, Minn.; R. E. Jorgensen, Conn.; W. C. Lefebvre, Ariz.; Thos. H. MacDonald, BPR; C. H. Purcell, Calif.; F. R. White, Iowa; M. A. Wilson, Del.

Treasurer: G. H. Henderson, Rhode Island.

Executive Secretary: Hal H. Hale, Washington, D.C.

The purpose is year-around utilization of equipment. The Oregon highway department has had good success with 2-auger rotary units mounted on Ford trucks.

Design details of blade and V-type plows are far from standardized, it was emphasized. Many states and other governmental agencies insist on plows made to their own specifications. Colorado and Minnesota have their own, which are claimed to include closer, better coupling to the truck, eliminating front wheel bearing trouble. Costs are sometimes—but not always—kept down by ordering special plows in sufficiently large lots at a single purchase. A sub-committee is to be appointed to investigate variations in snow plow and mounting design details required in the various states, with a view of selecting the best designs and seeking a uniform specification which would aid mass production of various plow types. Mounting details will be specially investigated; mounting the plows often costs as much as the plows themselves, according to one delegate.

An inconclusive discussion was held on the question of large vs. small motor graders for highway maintenance. Each state, it seems, places a different emphasis on various of the factors to be considered, such as use for snow-plow work, all-year operation, low unit or task costs, and ability to perform any job however heavy.

On winter work, a Minnesota delegate reported the growing use of motor graders for ice removal, hired on an hourly basis from contractors who tender bids early in the winter. Over 225 graders are available for spot assignment on short notice this winter. The scheme is considered to have many advantages, chief of which is that it obviates the need for the highway department to build up a state-owned fleet for winter work larger than that needed at other times.

Illinois maintenance officials also rent graders for winter work. Contractors furnish a machine and operator, paying all insurance during the rental period. Ohio's maintenance department rented many machines of various kinds during the recent blizzard emergency. Indiana's practice is to rent graders and other units by the day, week or month, having a rental rate for each specified in a standard agreement. The problem, according to the Indiana delegate, is to see that rented equipment is utilized to the fullest and not kept longer than necessary.

Kentucky also rents machines, for both construction and maintenance, to meet fluctuating needs and aug-

Bartlett Award to Baldock of Oregon



Mr. Baldock

R. H. Baldock, state highway engineer of Oregon, received the George M. Bartlett Award for 1950. Presented at the Miami meeting by Hal H. Hale, AASHO executive secretary, the Award is one conferred each year by friends of the late Mr. Bartlett to some individual who has made an outstanding contribution to highway progress. The award is sponsored jointly by the AASHO, the Highway Research Board and the American Road Builders' Association.

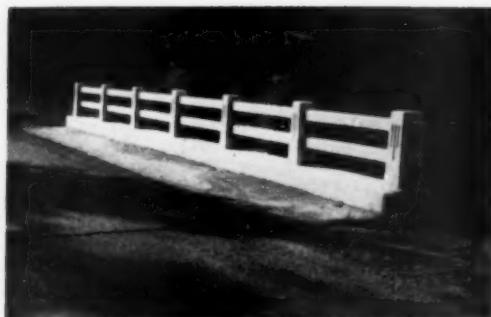
ment its large state-owned fleet; the law permits emergency rentals without competitive bids, but bids are taken whenever possible. A ceiling rental rate is stated, and the contractor is paid his bid price up to that ceiling. Over 70 bulldozers were rented to help clear roads after the once-in-a-generation snow storm of early December. In Kentucky, too, the engineers are on the alert to prevent overstocking of equipment, rented or owned. A plan under consideration would establish a minimum use in hours per year for various types of units assigned to each maintenance district. Districts not utilizing equipment fully would be relieved of certain units.

A morale problem is created when a maintenance department hires machines and operators from private owners. So stated a Connecticut spokesman, at any rate, who said that unionized maintenance employees have feared that equipment rentals represented a gradual encroachment on their jobs. It has been difficult to explain to union leaders that actually the practice of renting equipment for emergency or peak periods is a means of assuring 365-day employment for the regular working force.

(Additional details of certain committee sessions at the A.A.S. H.O. Miami meeting will be given in a later issue of *Roads and Streets*).



★ Skewed bridge over Bell Creek on Sparta Ave., Sparta Village, Kent County, Mich. Constructed in 1941.



★ Looks like Buck Creek at 44th St., Kent County, Mich.

Steel Pile Bridges

In Kent County, Michigan

A combination steel and concrete design for small bridges has given economical service in Kent County, Michigan. The deck is a reinforced concrete slab, and the railings are of concrete, as illustrated by the 50-ft. span pictured

By L. W. Brunson

Bridge Engineer, Kent County Road Commission, Grand Rapids

THE framework which forms the backbone of this structure is composed of 27-in. wide-flange steel beams, 10"x10" H-piles and 5"x3" angles so arranged and welded together that they produce a true rigid-frame bridge. The earth in the approach fills is held back by ordinary No. 10 gage galvanized pure iron corrugated sheets hanging in a vertical position and resting against the edges of the abutment angles.

13 Such Bridges

The site of the bridge shown is Plaster Creek on Eastern Avenue, just south of the city limits of Grand Rapids, Michigan. This was a pre-war project completed in 1940 by a County Road Commission crew, most of whose common laborers were assigned from WPA ranks. Thus the total construction cost is unknown. The survey, plans, materials, equipment, supervision and skilled labor cost the Road Commission a total of \$9,380, or about \$4.10 a square foot of deck.

This bridge was the 9th of a total

of 13 similar structures built by the Kent County Road Commission from 1937 through 1948. Their total clear spans run all the way from 15 ft. to 50 ft. Three of the thirteen are twin spans while the other ten are singles. The first two steel pile bridges built in 1937 were a single 24 ft. span and a twin having a total clear span of 46 ft. These two structures were built by County crews without WPA help at a total cost of \$5.15 per square foot of deck, including all engineering.

From 1938 through 1941, all similar structures were built with WPA assistance and total costs unknown. Between 1941 and 1947 no steel pile bridges were built.

In 1947, a twin span totaling 50 ft. was built by contract for a total cost of \$14,008 including blacktop approaches, channel change and all engineering. This represented an outlay of \$9.30 per square foot of deck.

In 1948, two single spans of 30 ft. and 40 ft. were built by contract with Federal aid. These were quite similar to the illustrated bridge except that the designs were slightly heavier and the 40-ft. span was built on a curve with super-elevated deck and curved curbs and railings. The total cost of

these two structures was approximately \$45,000 or \$20.25 per square foot of deck.

In arriving at the original design of this type of all-welded steel-frame bridge we were activated by a desire for several main features: namely, low initial cost, ease and low cost of widening, stability in case of extreme flood and long life without undue maintenance costs.

(a) Low initial cost is achieved by low cost abutments. This is particularly true where soft foundation soils would require piling to support concrete abutments.

(b) Ease and low cost of widening are achieved by using straight wings of easily welded steel, plus certain features in the shape and reinforcement of deck, curbs and railings. Widening requires the scrapping of curbs and railings only, and this can be done without injury to the deck, leaving the main deck reinforcement projecting about 15 in. for easy splicing.

Anchored Against Scour

(c) Stability in case of extreme flood is achieved by the rigid frame which extends down into the streambed far below the possibility of any scour. The washout of both approaches would leave the main frame and deck intact.

Long life and low maintenance cost seem to have been achieved, judging by our experience to date. Piles are con-



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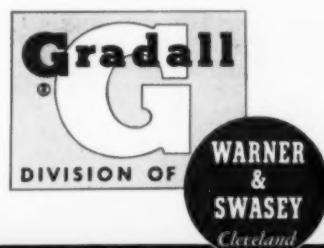
THAT'S WHAT A GRADALL OPERATOR FOR the Latrobe Construction Company of Latrobe, Pa. has to say about this amazing multi-purpose construction machine.

On this particular job—road construction at the Irwin Interchange on the Pennsylvania Turnpike—the Gradall was used for grading banks, digging ditches, rooting up concrete and sub-grading the highway. Best of all, it eliminated the hand work by sub-grading right up to the form.

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GRADALL—THE MULTI-PURPOSE CONSTRUCTION MACHINE



★ Plaster Creek Bridge at Eastern Avenue, Kent County, Michigan, constructed in 1940. Showing commissioners Henry Johnson, Wm. Joyce, and C. Marsman; Engineer Mngr. O. S. Hess; Secretary, L. E. Kaufman

crete encased from one foot above low water to three feet below. All structural steel can be reached for cleaning and painting and this has been our only maintenance on the 13 structures so far except as the result of one railing collision. This collision resulted in very extensive damage to the truck involved but did not put the damaged part of the railing down and out. Bridge repairs involved replacement of two posts and two rails plus three feet of curb which parts were displaced or partially shattered.

The bridges were designed by L. W. Brunson, bridge engineer, under the direction of Martin DeRuiter, assistant engineer, and Otto S. Hess, engineer-manager, of the Kent County Road Commission, Grand Rapids.

Fast Yardage Runs

L. G. Arnold Completes Another Fast Job

With a "best day" of 2300 lineal feet of 8"x20' concrete slab, the paving crew of L. G. Arnold, Inc., of Eau Claire, Wisconsin, completed a 243,000 square yard job recently in sixty working days. The paving covered 19.97 miles of Highway 53 in Trempealeau and La Crosse counties in Wisconsin. There were three projects of 9.4 miles, 4.9 miles and 5.6 miles.

★ L. G. Arnold's outfit in action on Highway 53, Wisconsin



one dual-drum paver. The accompanying table lists the principal equipment employed on the three jobs.

On the Osseo-Pigeon Falls job, sand and gravel was shipped in on railroad in hopper bottom cars from the commercial plant of the Wissota Sand and Gravel Company at Anson, Wisconsin. On the other two projects, crushed limestone was used. This was produced out of a local quarry by producer Clarence Weiss of La Crosse, Wisconsin. Sand was furnished by the A. T. Riese Company of Wisconsin Dells, Wisconsin, from local pits. The cement was furnished by the Lehigh, Marquette and Dewey Portland cement companies, all shipped simultaneously as these jobs were in progress. The batch hauling was done by William Buehler of Medford, Wisconsin, with a fleet of 25 to 30 trucks, which were available at all times and consisted of Chevrolets and Fords.

By-Passes Said to Help Local Business

A survey by the Chamber of Commerce of the United States reveals that highway by-passes have helped local businesses in the opinion of businessmen in the majority of 30 communities included in the survey. The 1950 Federal Aid highway law requires state highway departments to hear, publicly, the local townspeople affected by any proposed state highway by-pass on the Federal Aid System. As a result, many hearings will be held in the future where businessmen and others can make their views known regarding by-pass projects.

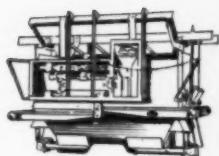
3,717 Miles "Lost" Through Diversion

More than 3,717 miles of road construction on the state highway systems of the nation were "lost" in 1949 because the states diverted \$166,111,000 in highway use tax revenues to nonhighway purposes, the National Highway Users Conference estimates.

This penalty for non-highway application of highway revenues becomes even more punitive to the highway user when consideration is given to the fact that, since 1934, a total of 108,508 miles of road could have been built with the monies diverted at the state level of government alone.

The "lost" mileage was computed by dividing the total amount of monies diverted in each state by the average highway construction cost per mile within each state for each year.

The "lost" miles in 1949 represents a decrease of 366 from 1948.



WEIGHING BATCHERS

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BUTLER PLANTS are widely recognized as examples of brilliant engineering in a great variety of materials handling problems. Here the experience of the BUTLER Engineer is invaluable.



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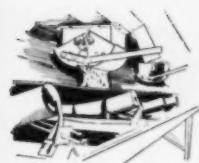
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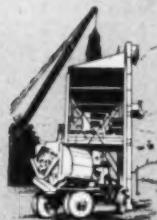
Compressor, engine, pump and complete controls all in one compact, space-saving unit. The BUTLER CEMENT AERATOR is essential to a smooth flow of cement.

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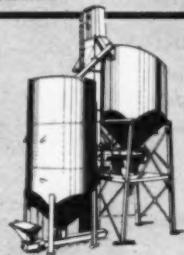
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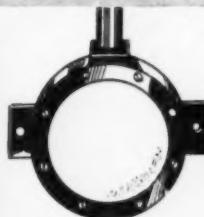
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Cuts Street Costs**

By R. F. Mott

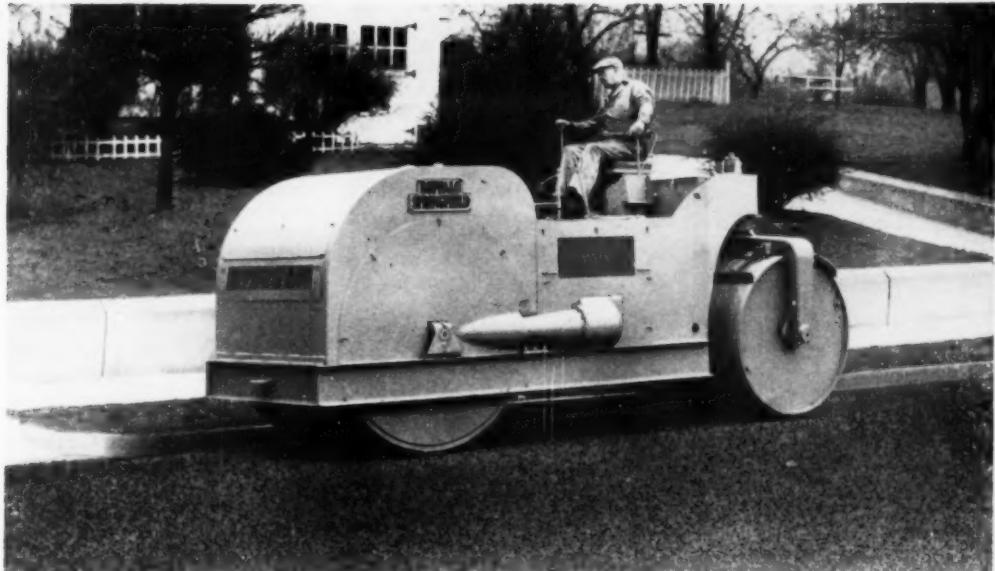
City Manager, Galena, Illinois

The largest part of all city revenue at Galena, Ill. (pop. 5000) is spent by the Department of Streets and Improvements. Beginning with the new fiscal year on May 1, 1950, the street crew carried out a program of grading, ditching, and graveling of unpaved streets; patching and repairing of paved streets; snow removal and street cleaning; sewer repairs and cleaning. At the beginning of the year 1949, the Department functioned on practically man-power alone, but in the fall the citizens voted 3 to 1 to issue \$20,000 of bonds to purchase street equipment.

The result has been a saving. Although revenue for the fiscal year 1949-1950 was \$6,982.18 less than the previous year, and administrative cost increased \$5,439.98, due to the hiring of a city manager, we reduced the deficit in the general fund by \$1,654.35 by May 1, 1950.

This saving to the city was achieved through an overhaul of city practices and procedures of the past. Some of the new ideas incorporated included purchasing the most efficient equipment and a more economical and effective use of man power. Expenditures were budgeted and an accounting system and preaudit of expenditures were introduced.

The major equipment purchase was a light motor grader (Allis-Chalmers Model D) with end loader, scarifier and snowplow attachments. This machine enabled a 40% reduction in manpower of the street department. The savings in wages alone were substantial. It was possible to do more grading in one day than could formerly be done by the old tractor and towed grader with two men in one week. The machine dug ditches in 4 minutes that formerly took one man with pick and shovel four days. The end loader attachment has taken only 4 minutes with two men (operator and truck driver) to load a truck with material where formerly it took four men 25 minutes. Many of our main traveled routes have better than 22% grades. In short, they are unbelievably steep. In spite of this, last winter's snow removal program was carried out with satisfying results, although not the ultimate in effectiveness. Snow in the business district was removed at a rate of about 150 cu. yd. per hour by the same motor grader. This, of course, followed the procedure of windrowing, picking up and dumping. Trucks were our problem. Some of the merchants donated trucks and



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Sometimes, job or performance requirements come first, and initial product cost is secondary. At other times, initial cost must come first. The final selection is easier if quality of product is available over a wide price range. That's why Buffalo-Springfield has added a new series of Standard Tandems to its famous Heavy Duty* Tandem line.

These new units—reflecting the quality of manufacture and design always associated with Buffalo-

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Springfield—have been built for long-term dependable performance and lowest-cost operation. Where job requirements are not unusual, or initial cost is the controlling factor, the Standard Tandem is recommended. For wide job versatility and extra ruggedness to meet the most severe operating conditions, the Heavy Duty Tandem remains in a class by itself. Compare either line with any other rollers made. You will find Standard Tandem better—the Heavy Duty Tandem best.

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★ Light motor grader with attachments reportedly cuts costs on street work in Galena, Ill.

drivers for carrying away the snow but the lack of an adequate number of trucks was apparent since the grader performed smoothly and could have loaded more trucks than were available.

Through the spring and summer, the grader worked at grading, bank cutting, sloping, and ditching, spreading gravel and placing an asphalt binder on as many unpaved streets as possible. The steepness of many residential right-of-ways demands ade-

quate and precise ditching for the control of high-velocity run-off. Now, most of our unpaved roads are worked to the point where they will be easily passable, even in bad weather.

Further savings to Galena are accomplished by prior planning and scheduling of work in the street building and maintenance program. Although attention is given to emergency complaints, sectionalized working on city streets is the usual thing. We repair roads, remove snow and clean streets in an orderly man-

ner rather than wasting time and equipment by running helter skelter throughout the city taking care of individual complaints. While all of the complaints are taken care of they are fitted into the overall program on the basis of urgency rather than political or other considerations.

Other work in this department, underway or just finished, includes participation in a levee and flood control program; construction of off-street parking by leveling and surfacing vacant property in the business district; new industrial sites to accommodate the interest being shown in this community by manufacturers; and the constant development of right-of-way to meet the rate of expansion.

Hand Excavation Costly

E. T. Nettleton, Associate Highway Engineer of the Connecticut Department of Highways, writing in NERBA brings up an interesting point as he discusses the effect of hand excavation costs on the profit and loss statements of contractors.

"Nobody wants to excavate by hand methods," he writes. "Nevertheless, there are situations when hand excavation must be utilized. The yardage to be excavated may be so small that

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it is not economical to transport, set up and operate heavy machinery. The location, or the type of work may be of such nature that machines cannot operate with efficiency.

"For example, machine excavation may not be the economical method for performing work in operations such as stripping rock ledges, cleaning out faults in rock ledges, digging adjacent to pipes and conduits, excavating for small footings and trimmings up after power machines have done the bulk of the work.

"Very few contracts contain a specified pay item for 'Hand Excavation.' Very few plans state the amount of material which will have to be excavated by hand. The engineer usually leaves the choice of machinery and method up to the contractor and that is as it should be."

"All too often, contractors pass over the problem of hand excavation as being too insignificant to consider," Nettleton continues. But, he points out the cost is there just the same and unless it is included in the bid there is a grave likelihood that the job will show a loss, rather than the anticipated profit.

After pointing up his statement with an assumed set of cost figures which turned an estimated \$900 excavating profit into an \$1,800 loss, Nettleton continues:

"The amount of excavation which will have to be done by hand is not generally publicized by the engineer. The chances are the engineer has not even computed this amount. Therefore, this task falls to the person who is doing the estimating for the contractor. This should not be a difficult job for one who is familiar with actual field operations and is capable of interpreting plans."

While this estimating may seem simple it bears a vital relationship to the profit or loss from the entire job and this cost should not be ignored in figuring bids on any project.

State-County Cooperation Successful in N. J.

Latest proof that state-county relationships in solving road problems are attainable with honest effort by both sides comes from New Jersey. That state's highway department has launched a series of meetings with freeholders and engineers from New Jersey's 21 counties to discuss better ways and means of coordinating the 8,000 miles of county and state highways and developing uniform standards in road-building procedure wherever possible. Both the state and the



Trouble-Free PERFORMANCE

"It's the only machine we've had for any length of time that has had no major repairs." That's what William Wylie, equipment foreman, says about the MICHIGAN 1/2 yd. Crawler Excavator owned by A. G. Woods Company, Windsor, Connecticut. Yes . . . it's quite a record for an excavator that has been "worked hard," 10 to 14 hours a day for a year and a half.



At Woody Crest Housing Development in West Hartford, Connecticut, the MICHIGAN digs service, sewer, water and drainage ditches . . . excavates for septic tanks and basements . . . loads trucks. Digging 450 feet of trench and laying the eight inch pipe is an average day's work.

Service records like this are typical for MICHIGAN Excavator-Cranes. Why settle for less? When you need an excavator-crane . . . investigate MICHIGAN . . . you'll agree it's your best buy! Write, wire or phone for complete details.

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480 Second Street, Benton Harbor, Michigan, U.S.A.



★ Chaining bridge helped survey party get across mud flats on bridge location

counties are determined to keep abreast of the 13 billion miles travelled annually in the state.

Over the July 4 and Labor Day weekends, the state put the county roads to work as alternate routes to relieve congestion on state highways—and with marked success. Some problems did arise—lack of coordinated marking of principal county roads, for example—and the meeting brought encouraging progress toward understanding the need for correcting such problems. Prequalification of contractors and standardization of county bidding procedures also received some thorough-going study and discussion.

Stakes Help Chain Over Marsh for Bridge Location

During the location and construction of the mile-long Turtle River Bridge at Brunswick, Ga., in 1949, the instrument party had the usual rough time with waves and soft tidal shoreland. Shown here is a photo of the target erected at one end of the bridge to mark the centerline, and a line of tall stakes or posts driven at intervals along the centerline to aid in chaining off-shore to the abutment structure just left of the picture.

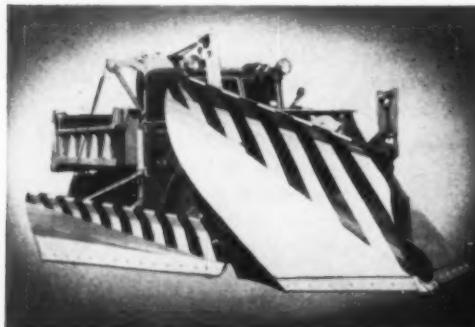
Also shown is a rough sketch of the triangulation scheme employed in checking location points, as pier work

with the floating equipment progressed. It consisted of running offset lines at right angles with the centerline (which was on a tangent throughout), offset or "T" lines being run 200 ft. laterally in both directions from the centerline either end of the bridge. From permanent stake points thus established, pier locations were checked by triangulation with an accuracy sufficient to permit the contractor to proceed with locating points to sink pre-fabricated coffer-dam framing and begin driving sheeting.

Minnesota Highway Department Contracts Maintenance Aggregate

Mineral aggregate required in various maintenance operations by the Minnesota department of highways is obtained by contract as a policy according to C. L. Motl, maintenance engineer.

During 1950, a total of 48 contracts were let, comprising a grand total of 1,308,000 tons of mineral aggregate. The average price paid the contractor for crushing, screening and loading f.o.b. trucks was 31.4c per ton. The



Without the use of exposed cables, chains or pulleys for raising and lowering the truck end of the wing push braces. Full Selective Control means quick, accurate, individual adjustment of the nose plow, either end of the leveling wing or the wing push braces by separate levers, conveniently located in the cab.

**FRINK IS THE ONLY
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**FULL Selective
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Operational efficiency is greatly increased. It isn't necessary to reduce speed to make adjustments of the plow or leveling wings. A snow plow equipped with Frink Selective Hydraulic Control can cover several times the mileage in an equal amount of time than a plow with manual equipment.

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lowest price paid any contractor was 18c per ton, and the highest price 52c per ton. The material was generally crushed to $\frac{3}{4}$ -in. maximum size, and in most cases the contractor was also awarded the hauling work, either onto the highway or into stockpile, for an additional cost on a ton-mile basis. These are not included in the above price. The location of pit and nature of material to be crushed were major influencing factors in the cost of the work.

Under our gravel material contracts the States provided the gravel pit from which the contractor produces the material.

The foregoing prices cover crushing of pit-run gravel. In addition to the above, the State let two contracts, totalling 44,000 tons of crushed stone material, crushed to $\frac{3}{4}$ -in. size and delivered on the road or in stockpile, at a lump sum unit price of \$1.60 per ton in place. Because contractors producing this type of aggregate usually owned their quarries, it has been the practice in Minnesota to let such contracts on a delivered basis, rather than on an f.o.b. truck basis.

1951 Legislative Proposals

New proposals to raise additional highway revenues continue to be reported. In Maine, a revised plan to be submitted to the 1951 legislature calls for a \$27,000,000 highway bond issue. The New York Good Roads Association wants a \$375,000,000 highway bond issue and an anti-diversion amendment.

In New Jersey, Governor Driscoll said possibilities of a state highway bond issue would be studied after highway needs have been inventoried.

The League of Wisconsin Municipalities proposes an increase in the state gasoline tax from 4 to 5 cents.

An additional 1-cent-a-gallon gasoline tax specifically earmarked for primary roads, together with possible further highway bond issuance, has been suggested in Arkansas.

A new movement for highway improvement is being launched in Missouri, without indication yet as to what new revenues will be sought.

"Bituminous Roads and Streets"

Section begins on page 77. Turn to this Section each month for timely articles on design, construction, maintenance, materials, testing research.



Sauerman Slackline Cableway

For 41 years the Sauerman Slackline Cableway has been the favored machine of the sand and gravel industry for wet pit excavation. It has no equal for low cost results in digging a large, deep pit and moving material in the same operation direct to top of plant or surge pile. The operator's job is easy and maintenance is simple. With occasional replacement of a few parts, a Sauerman machine will work at top capacity for many years and return its owner big profits.

STORY BEHIND THE PICTURE

The gravel plant of Louis Marsack & Sons, Mt. Clemens, Mich., offers a typical example of how the Sauerman Slackline Cableway enables its owner to build up a profitable business on a modest investment. The Marsack firm has for years been one of the leading suppliers to the Detroit market and all of its pit excavation has been handled by Sauerman cableways. The picture shows the present pit, 700 ft. wide by 60 ft. deep, and the 1 cu. yd. Sauerman machine.

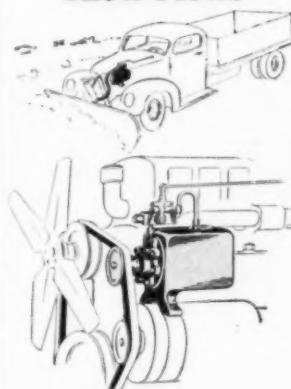
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Equipment
Specialists
Since 1909

SAUERMAN BROS., Inc.

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CHICAGO 7, ILLINOIS

POWER HYDRAULICS for Snow Plows



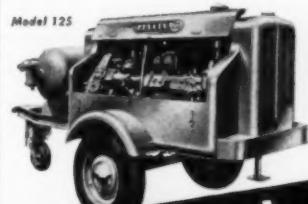
- Clutch operated
- Thousands in use
- Fan Belt or Electrically Driven
- Fit All Trucks

Write Hydraulic Division

MONARCH ROAD MACH. CO.

322 North Front Ave.

GRAND RAPIDS 4, MICHIGAN



4 days' work
now done in 3



with
JAEGER
"new standard"
compressors

Jaeger Model 125 runs 2 heavy duty or 3 medium breakers at full 90 lbs. pressure, doing 30% to 40% more work than at 70 lbs. pressure from a 105 ft. machine.

Other Jaeger "new standard" sizes, 75, 185, 250, 365, and 600 ft., give you comparable work increases. Cost no more than smaller old sizes. Send for Catalog and prices.

THE JAEGER MACHINE COMPANY
223 Dublin Avenue Columbus 16, Ohio

NEW EQUIPMENT AND MATERIALS

New and Improved Construction Projects

Additional sets on products described below can be obtained from the manufacturer via postcard inserted at page 92. Each item is numbered. Just circle the corresponding number on the card and mail.

1

Portable Air Compressor

An improved 105 ft. portable air compressor announced by Worthington Pump and Machinery Corporation, Harrison, N. J., is lighter, lower and more maneuverable. It is built around the



Diesel Driven Air Compressor

standard Worthington Blue Brute compressor and is powered by either diesel or gasoline engine. New features and advantages claimed include: new zero pressure retractable third wheel; new underslung spring mounted undercarriage with heavy duty commercial 15 in. trailer tires; a simple, retractable support leg; a new style unit core radiator with pressure cap to prevent boiling and better operation of engine at higher temperatures and altitudes; a new carburetor with fixed jets for better economy; and relocation of instrument panel and battery box to give unrestricted full length tool boxes.

2

Bituminous Spray Bar

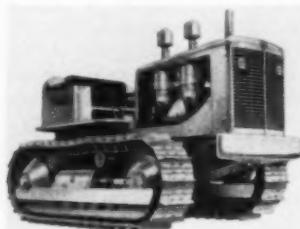
A new, non-clogging, no-drip asphalt spray bar to fit all distributors has been announced by the Wm. Bros. Boiler and Manufacturing Co., Minneapolis, Minn.

Developed by H. A. Cartwright, the bar, known as the Bros Spreymatic, is specially built for dependable handling of heavy bitumen material. It is a full circulating, 3-section hot bar, designed to eliminate non-uniform distribution, leaky valves, fat and lean streaks and clogged orifices. Among the exclusive Bros Spreymatic design features are the positive end-to-end circulation system accomplished by means of a center partition the length of the bar; the new, non-clogging, self-screening nozzles and the ring packed, non-leaking, 45° swing joints.

3

New A-C Tractors

Two new crawler tractors, the HD-9 and HD-15 have been added to the line of Allis-Chalmers, Milwaukee, Wis. The



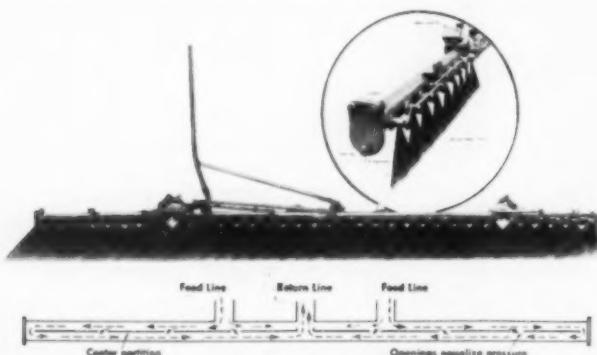
New Allis-Chalmers HD-15 Tractor

HD-9 weighs 18,500 lb. and has a drawbar horsepower rating of 70. The HD-15 weighs 27,500 lb. and develops 102 HP at the drawbar. Both have six speeds forward and three reverse. Power is provided by heavy-duty General Motors 2-cycle diesels. Most of the features tractor owners, operators and servicemen are likely to find of interest are common to both the HD-9 and HD-15. One of these is a constant mesh transmission, with separate reverse gears, that lets an operator shift from forward to reverse in any speed with just one movement of a single control lever.

4

Heater for Cold Weather Jobs

A new portable heater, developed by a former contractor, Robert Roberts, presi-



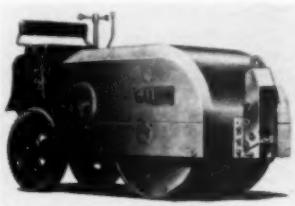
Bros Spreymatic

dent of The Portable Heater Co., Cleveland, O., is stated to be capable of raising the temperature of a cold room from 30 degrees to 80 degrees within 20 minutes, without odor, fumes, grease, or smoke. Weighing only 55 lb., and designed for easy, economical operation, the heater needs no manual pumping. Concentrated fuel, hot test bottled gas (instant heat) is held under pressure in a 20-lb. cylinder. Tests are stated to show that fuel costs average \$1.00 per day for continuous 8-hour operation.

5

Portable Roller

A new model variable weight portable roller, announced by Galion Iron Works & Mfg. Co., Galion, O., is stated to have



Galion New Portable Roller

several outstanding advancements. Steering is now done by hydraulic power under finger-tip control. A rugged spur gear final drive replaces the old chain drive, and a constant-mesh transmission eliminates gear-clashing and assures smooth gear-shifting. Other improvements are: easily adjusted Twin Disc, over-center, forward and reverse clutches; new design hydraulically operated towing hitch which folds back compactly against roller housing when not in use. Compression under roll, without water ballast, is listed at 130 lb. per inch of roll width. With 2300 lb. of water added to the roll, compression is raised to 192 lb. per inch. The compression roll is 48 in. diameter by 42 in. wide. It is fitted with mats and sprinkler system.

6

Rock Bit Hole-Saver

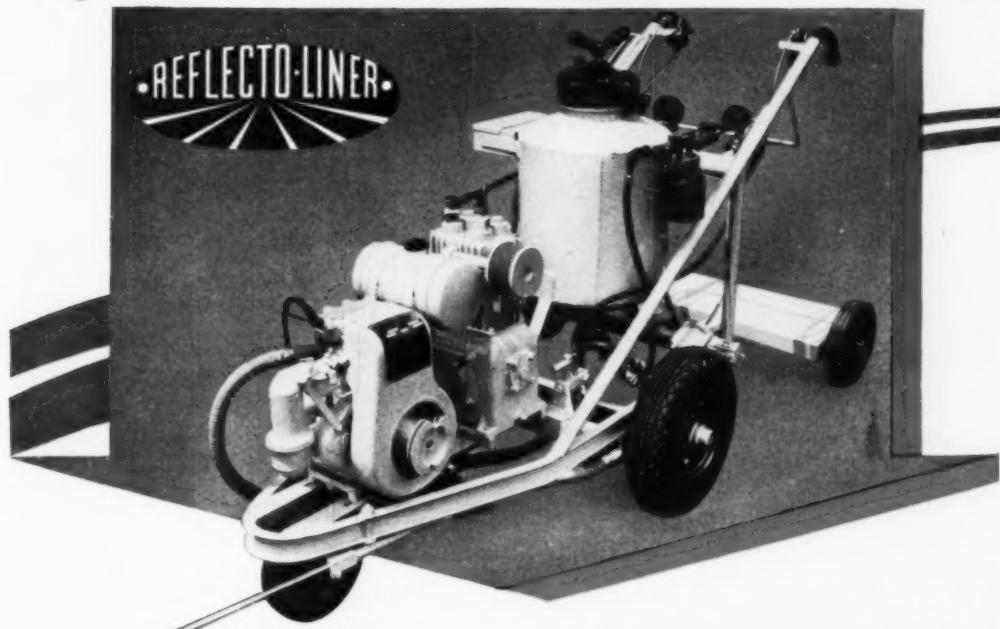
A recent product of Rock Bit Sales & Service Co., Philadelphia, Penn., is a tool for reclaiming lost bits and drill steel broken off in the hole so as to save re-



Rock Bit Hole-Saver

drilling the hole. Attached to a threaded steel in place of a bit, its peculiar left-hand, tapered threads cut in the metal of the broken rod and remove it quickly, easily and without jamming, according to the manufacturer. The tool is threaded for Timken H or D; Rock Bit R-1 or R-2 steel to fit the following size steels: (a) $\frac{7}{8}$ in. Hex., $\frac{1}{2}$ in. Q. O.; 1 in. Hex., 1 in. Q. O., $1\frac{1}{8}$ in. Rd.; (b) $1\frac{1}{4}$ in. Rd. and $1\frac{1}{2}$ in. Rd.

Now! ONE STRIPER FOR ALL MARKING MATERIALS...



...WITH MAXIMUM OPERATIONAL EFFICIENCY FOR EACH!

The new Wald "REFLECTO-LINER", Model 12, is the first *major improvement* in striping machines since their introduction. It is the *only* striping machine designed specifically for *reflective* marking materials, handling with maximum efficiency: premix, reflective binders, and ordinary traffic paint as well. *All* materials are handled with equal efficiency and facility.

The "REFLECTO-LINER", Model 12, STRIPER introduces the high capacity "Nu-Matic" spray gun which contributes greatly to the overall efficiency of the machine, laying a clean sharply defined line with an even cross distribution of material.

A constant 100% air reserve supply is maintained at all times during operations, without burdening the compressor or motor. Continued efficient operation

is assured as a result of this reserve capacity—"The heart of a striping".

Specific features of the new Wald "REFLECTO-LINER": channel and tubular steel anti-vibration frame; pneumatic and zero pressure wheels, puncture proof front tire; Hi-speed, 6 H.P. air-cooled gas engine, that *purr* not races with heaviest striping materials, operates 2 to 5 MPH; ribbed drivers insure positive drive; compressor (large) 12.5 cu. ft., handles thinnest traffic paint to thickest compound; tank—12 gal. supply—wide mouth (5.75 in.); strainers in paint line for easy removal of foreign matter; spray gun—hi-capacity producing uniform cross distribution. "Nu-Matic" design minimizes replacement parts; engineered for easy maneuverability, especially when reflective coatings are used.

The "REFLECTO-LINER", Model 12, has been tested by the Prismo Laboratories, Huntingdon, Pa. and found to be in accordance with these claims.

For complete information send for Bulletin # 507.

Wald Industries Inc.
MONTGOMERY, PA.



When writing advertisers please mention ROADS AND STREETS, January, 1951

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 92. Each item is numbered. Just circle the corresponding number on the card and mail.

7 Motor Grader

A new motor grader, the Model 118, announced by The Galion Iron Works & Mfg. Co., Galion, O., is of the extra heavy-duty class and features a greatly improved transmission of the constant-mesh type. It has six overlapping forward speeds ranging from 1.3 to 22.6 miles per hour and two reverse speeds. A reverse speed of 10.5 is obtainable. Only one lever is needed for the shifting of all gears, forward or reverse. Among



Galion Model 118 Motor Grader

the features of Model 118 are a 100 h.p. diesel engine; positive all-gear, four-wheel tandem drive; full hydraulic control; and extra-rugged box-type single member frame, high-arched for maximum adjustment of blade. Also included as standard equipment are hand steering with hydraulic booster and large front tires same size as rear tires. Available, as extra equipment, is a hydraulic shiftable moldboard which permits a maximum extension of the blade 103 in. beyond rear tires with a 13 ft. moldboard. Weight is from 23,560 lb. up depending upon extra equipment.

8 Flare Nut Wrenches

Two new flare nut wrenches which increase the range of these popular tools to $1\frac{1}{8}$ in. have just been announced by the Owatonna Tool Co., 435 North Cedar St., Owatonna, Minn., stated to be ideal for fuel, hydraulic and gas lines on diesels, tractors, refrigeration units, etc. The wrenches are made with hex openings to provide a better bite and to prevent turning the corners on soft brass nuts usually

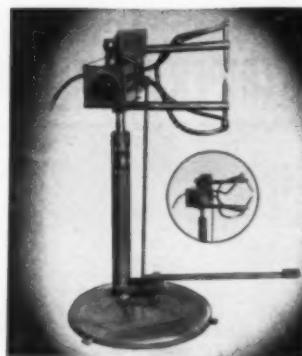


OTC Flare Nut Wrench

found on copper lines. Drop-forged from high alloy steel, fully heat-treated with chrome plated finish. No. CS-2428 $\frac{5}{16}$ in. - $\frac{1}{2}$ in. No. CS-3238 1 in. - $1\frac{1}{8}$ in. Three other wrenches of the flare nut type, covering the smaller automotive sizes are also available. No. CS-1214 $\frac{1}{8}$ in. - $\frac{1}{2}$ in. No. CS-1618 $\frac{1}{2}$ in. - $\frac{5}{8}$ in. No. CS-2022 $\frac{5}{16}$ in. - $\frac{1}{2}$ in.

9 Pedestal Rocker Arm Welder

A new and simple spot welder for general use has been announced by Universal Welder Corporation, Cleveland, O. The welder is of the rocker arm type—



Universal Spot Welder

with reversible arms for vertical and slant electrode holder mounting. The unit pictured here is rated 5KVA 220 volt 60 cycle 50% duty cycle in accord with RWMA practices and can make welds in sheets from 2 No. 28 gauge to 2 No. 20 gauge steel. Throat depths may be varied from 3 in. to 15 in. by adjusting the arm length. Arm spacing may be adjusted also and the arms can be swivelled to get into unusual places.

10 Portable Lighting System

A new low-voltage portable lighting system for mining and construction work, the Joy-Lite, has been announced by the Joy Manufacturing Co., Pittsburgh, Pa. Driven by compressed air, the Joy-Lite will develop an output of 250 to 280 watts (power to operate four high-powered sealed-beam flood or spot lights) with air consumption not exceeding 25 C.F.M. For protection from dirt and dripping water, the generator is mounted in a steel box which is equipped with a carrying handle for easy portability. Lamps have tripod swivel bases, which can be used as column clamps, and hooks which serve as hangers. The unit weighs 48 lb.

11 Portable Gravel Plant

A new addition to their Traveler Series of gravel crushing, screening and loading plants has been announced by Universal Engineering Corporation, Cedar Rapids, Iowa; Division of Pettibone-Mulliken Corporation of Chicago. Named the Model CSE Traveler, the plant consists of a jaw

crusher, shovel loading hopper with reciprocating feeder and trap grate, feed conveyor, one-deck inclined gyrating screen, delivery conveyor, return bucket elevator, and power unit mounted on a steel gooseneck truck with pneumatic tires. The CSE traveler is designed to produce accurately sized material for road building and maintenance with a single crusher in a closed circuit. Four sizes are available with 916, 1016, 1020 or 1024 jaw crushers in either bronze or roller bearing types.

12 Paving Breaker

A 50-lb. paving breaker has been added to the line of Cleco pneumatic tools of Reed Roller Bit Co., Houston, Tex. The



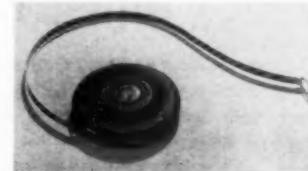
Cleco RC-50 Paving Breaker

new drill, the Cleco RC-50, incorporates the same type Reed-Cleco valve as that used on the heavier paving breaker, the RC-80. This valve, the manufacturer states, gives full control on both power and return strokes, assuring hard, uniform blows, fast action, minimum recoil, no short-stroking and low air consumption.

13

Tape Has Automatic Rewind

A new 50 ft. steel tape which rewinds automatically, developed by Master Rule Manufacturing Co., Inc., Middletown,



Master Longboy—050 Tape

N.Y., is reported to be the first engineer's tape which requires neither wind-crank nor hand-reel. Another significant feature from the surveyor's



Model CSE Traveler Gravel Crushing, Screening and Loading Plant

From A to Z

**BUCYRUS
ERIE**

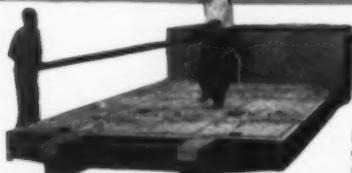
- Accessibility
- Balanced Speeds and Power
- Convertibility
- Durable Construction
- Easy Maintenance
- Fast-Digging Dippers
- Ground-Gripping Treads
- High Quality Engineering
- Independent Positive Crowd
- Job-Proved Efficiency
- Keeps Downtime Low
- Lasting Adjustments
- Maneuverability
- No Useless Deadweight
- Operating Ease
- Precision Control
- Quality Materials
- Responsive Clutches, Brakes
- Simple, Sturdy Design
- Time-Tested Reliability
- Unmatched Workmanship
- Vibrationless Power Flow
- Wide Working Ranges
- X-perience Unequalled
- Year-Round Dependability
- Zip and Zest for Hard Service

No other line of excavators brings you more output-producing features than Bucyrus-Erie's $\frac{3}{8}$ - to 4-yard gasoline, diesel and single-motor electric excavators!

There's a Bucyrus-Erie in the size and capacity you need for peak production on your shovel, dragshovel, dragline or crane jobs. See your Bucyrus-Erie distributor for complete information.

BUCYRUS-ERIE COMPANY
SOUTH MILWAUKEE, WISCONSIN

Like the Camel.. IT GETS DOWN!



For EASIEST possible LOADING, the frame is lowered to ground WITHOUT BLOCKING.

FOR EASIER LOADING!



Maximum deck height of ONLY 16 INCHES assures RAPID, SAFE LOADING of equipment.

ROGERS POWER LIFT DETACHABLE GOOSENECK TRAILER

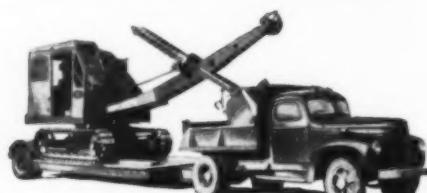
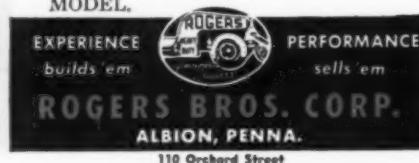
PATENTS PENDING

5 EXCLUSIVE ADVANTAGES

1. Carries heavier loads on larger tires.
2. Detaches quickly for fast, easy front loading.
3. Stoops to clear low overhead obstructions.
4. Raises its deck to clear high banked crossings.
5. Is detached, loaded and reattached in 5 minutes.

Yes, with this unique trailer you can detach the gooseneck, load up, reattach the gooseneck and drive off in a matter of ONLY 5 MINUTES.

Complete Literature available upon request—Any Rogers Dealer will demonstrate its features right on your deck, with an OPERATING SCALE MODEL.



Also of timely interest is this ROGERS Tag-A-Long trailer which makes a dump truck serve as a tractor and effects sizeable savings for contractors.

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 92. Each item is numbered. Just circle the corresponding number on the card and mail.

standpoint is the easy interchangeability of rule blades—so that tapes divided in eights of an inch can be replaced by tapes divided in tenths and hundredths of a foot, right on the job. Thus, worn or damaged tapes can be replaced without discarding the case or rewind mechanism. The tape rewinds with a constant retracting torque, whether the full 50 feet or only the last inch is out. A 100 ft. model will be available early this year.

14

Power Wheelbarrow

A new self-powered wheelbarrow marketed by the S and S Vending Machine Co., San Jose, Calif., will pull a full load



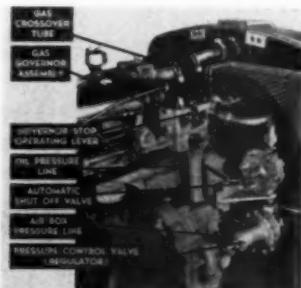
"Pow-R-Barrow"

up a 40% grade. Compression acts as a brake on the downgrade. Speed on the level is a comfortable walking pace. An air-cooled engine mounted beneath the bed drives by friction on the tire treads, with simple controls all on the right handle.

15

Dual-Fuel Diesel Engine

The Detroit Diesel Engine Division of General Motors, Detroit, Mich., has announced a new option on Series 71 diesel engines which enables them to burn



Close-up of GM Diesel Dual-fuel unit showing changes required on blower side of engine. Note the lever on gas governor assembly which effects instant changeover from Dual-fuel only to straight diesel or partial Dual-fuel operation.

natural gas in accordance with true diesel high-compression principles. This option is available both on new engines leaving the factory and engines already in use. For the latter a factory-engineered kit is available for the changeover. The

(Continued on page 73)

*Versatility and
Power make this HUBER
a Real Maintainer!*



Look at its versatility! Hydraulically controlled attachments quickly and easily convert it to bulldozer, lift loader, highway mower, berm grader, broom, road planer, patch roller or snow plow service.

Look at its power! . . . 42½ H. P.

Other important advantages: 1—The blade is PUSHED by Huber's exclusive modified A-frame design. Power is transmitted to the moldboard DIRECTLY from the driving wheels. The result: better traction, less power loss and more efficient use of the machine's 6000-pound weight.

2—The HUBER Maintainer gives you maximum work results and versatility in a single, one-man machine at modest investment and operating costs.

Get more for your maintenance dollars—your nearest HUBER Distributor will show you how.

HUBER

SINCE 1863



MANUFACTURING COMPANY • MARION, OHIO, U.S.A.

MANUFACTURERS OF HUBER MAINTAINERS, GRADERS AND COMPLETE LINE OF ROLLERS
When writing advertisers please mention ROADS AND STREETS, January.

Save time! Save labor!



WITH THE new "CARRY-LINER" TRAILER...

The new Wald "CARRY-LINER" TRANSPORT TRAILER is fast, economical and labor saving! It eliminates the time consuming job of loading and unloading your striping machines on trucks and the consequent danger of back strain to your men and damage to your stripers. Designed to transport larger type striping machines such as the Wald "Reflector-Liner" Model 12; Wald "Traffic-Liner" Model 8; Kelly Creswell stripers, B3P and B3. The mounting and unmounting of these stripers on the "CARRY-LINER" TRAILER is now a simple one-man operation. The stripers are rolled on the trailer, locked securely and you are ready to go.

The "CARRY-LINER" TRAILER may be hitched on car or truck.

The "CARRY-LINER" TRAILER has been tested at fast speeds to insure safe transport of your equipment at legal speeds.

For in-between-job or off-season storage the "finger-tip" balance of the "CARRY-LINER" when unhitched, permits it to be rolled away and stored without dismounting the stripers from the trailer. It's easier to move a loaded "CARRY-LINER" than to move the stripers itself.

The "CARRY-LINER" MODEL T2 TRAILER has been tested by the Prismo Laboratories, Huntingdon, Pa. and found to be in accordance with these claims.

For complete information send for Bulletin #506.



Wald Industries Inc.

MONTGOMERY, PA.

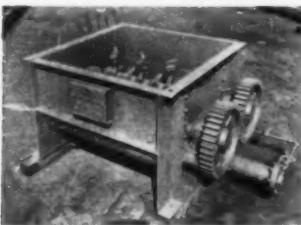
Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 92. Each item is numbered. Just circle the corresponding number on the card and mail.

(Continued from page 70)
changeover permits the engines to burn either natural gas with a pilot charge of diesel fuel or diesel fuel alone. There is no interference with the operation of the unit as a straight diesel fuel engine when required. Change from dual-fuel to diesel fuel operation is accomplished instantly by moving a small lever on the gas governor assembly.

16

Twin Shaft Mixer

A new twin shaft mixer, announced by Standard Steel Corporation, Los Angeles, Calif., incorporates an advanced patented principle of attaching sectionalized lining for easier and more economical replacement. The lining surface of the mixer, instead of being one solid piece, consists of several smaller sections, bolted to the heavy welded steel body



Standard Mixer

from the outside. No holes or bolts extend through to the wearing surface. An additional feature of the Standard mixer is that roller bearings are employed in place of sleeve bearings thereby greatly reducing the horsepower required for operation. The machine is available in two models and is adaptable to all makes of asphalt mixing plants.

17

Sub-Grade Planer

The Ferguson sub-grade planer now being manufactured by Shovel Supply Co., Dallas, Tex., is designed as a heavy duty, rigid machine which will not deflect under extreme loads. The planer is stated to be especially suitable for airport work. Its 10,000 lb. weight and sturdy construction make it possible to carry excess dirt forward to where



Ferguson Sub-Grade Planer

needed. The blade will cut from 6 to 14 in. in depth and is instantly adjustable up and down by ratchet jacks acting independently on each wheel. The curved moldboard uses standard grader blades for flat grades, or special blades can be furnished to cut any contour of grade desired.

18

Vapor Steam Cleaning Machine

A new and improved heavy duty type vapor steam machine announced by the General Equipment Division, Sterod Manufacturing Co., Newark, N.J., has a fully automatic, safety protected system which enables one-man operation while at the same time accelerating the clean-



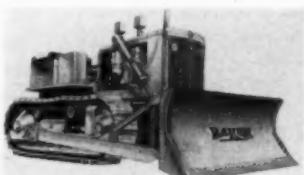
"General" Vapor Steam Cleaner

ing process. It is stated that a full operating pressure is generated within 90 seconds. It is also stated that no troublesome pre-mixing of the cleaning compound is necessary nor is time wasted in adding or adjusting the water or agitating the unmixed compound. From the point at which the dry compound is placed in its tank until it emerges as a super-saturated jet of steam from the gun the whole mixing operation is fully automatic.

19

Bulldozers, Gradebuilders, Rippers

New bulldozers, gradebuilders and root rippers for the new and more powerful Models HD-9 and HD-15 Allis-Chalmers tractors have been announced by The



New HD-15 With Bulldozer

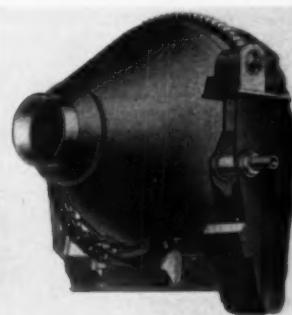
Baker Manufacturing Co., Springfield, Ill. These implements round out a complete line of matched earthmoving equipment for A-C tractors, Baker having previously announced new blades for the largest and most powerful unit, the HD-20 and the smallest, the HD-5. Both engine-mounted hydraulic and cable operated models are available for the three larger tractors. Blades for the

HD-5 come only in hydraulic control type. The new Baker products are more ruggedly built to match the greater size and power of A-C's new larger units. All hydraulic models retain the special Baker features of direct lift, positive down pressure, positive hydraulic hold and engine accessibility. Achievement of "fingertip" control for the new Baker attachments is the outstanding design feature; gained through the short linkage between blade control lever and hydraulic control valve.

20

Tilting Mixer

A tilting mixer for new central mixing plants and those converting from dry batching to central mixing has been announced by Supremix, Inc., an affiliate of Gene Olsener Corporation, Adrian, Mich. The Supremix mixer is an integral part of the plant structure, thus eliminating elevated foundations or separate mixer platforms. Due to its unique tilting arrangement, the mixer is located



Supremix Tilting Mixer

lower in the structure, which saves headroom, at the same time allowing for sufficient height for delivery equipment and gives lower overall plant height. The mixer tilts hydraulically and discharges without splash or spill and without discharge segregation. By this method of tilting, no collecting hopper is necessary, as the mixer tilts directly into the delivery equipment. The power source is external of the mixer tilting frame, thus allowing for any kind of diesel, gasoline or electric power.

21

New Features for "Cat" D4 Tractors

Seat-mounted fuel tanks, with increased capacity to 30 gals., are now standard equipment for the D4 Tractors of Caterpillar Tractor Co., Peoria, Ill. The current fender-mounted fuel tanks will be offered as optional equipment. In addition to the new seat-mounted fuel tank, several other revisions were made to D4 Tractors. These include new, heavy-duty, rigid, plate-type fenders that are free from obstructions to provide more room for installation of attachments; new operating levers and controls for the clutches, gear shift and brakes; and a new, out-of-sight tool box, located under the seat. The tool box is fabricated as a part of the seat-mounted fuel tank assembly.

(Continued on page 93)

4 TOP PRODUCERS THAT INVITE COMPARISON



1 TwinDual Pacemaker Rock Plant

3 TwinDual Master Gravel Plant—double the output of conventional two-stage plants of comparable size and weight



2 TwinDual Gravel King—three stages of crushing, two screens for pits with large boulders

4 TwinDual Secondary with 546P Primary. High capacity with two portable units for quarry operation



UNIVERSAL'S TWINDual PLANTS FOR ROCK AND GRAVEL

Out in front! Universal TwinDual Plants are breaking production records and cutting costs per ton on finished aggregate.

Universal "Stream-Flo" engineering does it with the TwinDual Method—the modern system of crushing and screening that gives three full stages of reduction with only two crushers. You get more production, less jaw and roll shell wear, longer life, less maintenance.

Before you make an investment in a crushing, screening and loading plant for rock or gravel investigate the profitable bonus you get with a TwinDual installation. Compare TwinDual Plants with the field. Get the facts now.

How many crushers do you need? for 3 full stages of reduction?

The TwinDual Method does it with two—

First Stage—Jaw Crusher

Second and Third Stages—TwinDual Rolls

UNIVERSAL ENGINEERING CORP., division of PETTIBONE MULLIKEN CORP.

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Phone 7105

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2-Speed Truck

AXLES

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More trips with full load whether roads are good or bad—that's the contribution of Eaton 2-Speed Axles to greater truck operating profits. Eaton 2-Speeds have double the conventional number of axle gear ratios. As a result, the tremendous power of today's engines is utilized to best advantage—speed for good roads . . . pulling capacity under full load for tough spots. Regardless of driving condi-

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1 Bituminous ROADS AND STREETS



• Spreading cold emulsified asphalt gravel mix on Farm-to-Market road, Wayne County, Indiana, see article inside.

How an Indiana County Achieved Durable Low Cost Roads
A Highway Leader is Known by the Employees He Keeps
Hot Shipped Asphalt Aids Air Forces Runway Crew
Heater Dries Stone in Trench for Widening Project
Widening Old Single-Lane Pavement with Stone Macadam
Big Spreading Hoppers Cut County Graveling Costs

JANUARY, 1951

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Completely Portable Plant Has Capacity in 60 t. p. h. Range Produces All Types of Mixes

Here is the industry's most advanced Bituminous Mixing Plant . . . completely portable, built for maximum simplicity in erection and operation, and precise control of measurement and proportioning of aggregate and bitumen. The new Utility Mixing Plant minimizes the time required for setting up or dismantling; its three basic units tow behind ordinary trucks or tractors—and it has the versatility to produce all types of mixes, including the highest types.

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- ★ Faster erection—no cribbing necessary
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- ★ Built-in Elevators on Dryer and Mixer
- ★ High Discharge Dryer eliminates hot elevator pit
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- ★ Only two power units
- ★ Four-cyclone Dust Collector
- ★ Lowest maintenance cost per yard produced
- ★ Ask your Barber-Greene distributor or write for full information.

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... NEW EASE IN ERECTION!

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NEW PORTABLE 845 MIXER-GRADATION UNIT

... For precision volumetric measuring, proportioning and mixing of aggregate and bitumen.



NEW PORTABLE 835 DRYER

... With built-in Reciprocating Feeder and High Discharge Elevator which eliminates the need for a hot elevator pit.



NEW PORTABLE 852 DUST COLLECTOR

... Four-cyclone type:
contains power unit for
Dryer, Cold Elevator,
Feeder, Hot Elevator,
Screens, Dust Collector,
Exhaust Fan and Low-
pressure Blower.

B Constant Flow
G Equipment

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★ An all-weather paved county road in Wayne County, flanked by corn crops (Photos by Roads and Streets editorial staff)

How an Indiana County Has Achieved Durable

Low Cost Roads

A gravel-emulsion plant mix surface on chloride stabilized gravel base is giving excellent results in Wayne County, Indiana, where good management has been enjoyed with minimum political interference for many years.

A COUNTY whose citizens are enjoying better-than-average quality roads for their money, in the opinion of some observers, is Wayne County, Indiana. The results stem from what every county road organization strives to have: good management.

The first reaction of the Roads and Streets staff reporter after visiting Wayne County was to credit this county's good showing simply to the construction procedure. But the credit, if any, goes deeper than that, and first a few words about the county road organization.

In this state the County Board of Commissioners comprises three men elected for 3-year terms. This board appoints the County Road Supervisor, whose function is to build and maintain the roads. Township governments also exist but have no road function. Wayne County is one of the few Indiana counties in which the road supervisor has been left alone to do a job with a minimum of political interference. The county board and council have seen fit to let the present supervisor stay around for 16

years and build up a permanent organization. Of the present staff of 32 employees, ten have served the county 20 years or longer, some as high as 26 to 30 years. Several others are 8 to 10 year men.

Leadership Shown

Leadership of course requires a leader, and Supervisor Ernest H. Coffin evidently has provided good leadership. First of all he has been able to pick good men and delegate authority to them. The staff today consists of a general foreman, a culvert foreman and crew, and several foremen in charge of road gangs. These men know their jobs from long experience, leaving the supervisor free to plan and do the friendly public relations work so necessary to keeping business groups, farmers, newspaper editors, and the public in general acquainted with highway needs.

Beginning some years ago Mr. Coffin became a leader in seeking advantages that would make it possible to build and hold a good county organization. Wayne County today is one of the few Indiana counties (actually there are

only three) which offer employees the inducement of a retirement plan, permitted under a state legislative act, which Mr. Coffin and others were influential in having enacted. Also workers have insurance benefits, holidays, vacations with pay, and a year-around straight salary for key men. All this helps explain the high morale.

Wayne County's 60,000 population is served by a county road network of 734 miles, this mileage including all classes of public roads except state arterial. The roads are 100% surfaced with gravel or better. About 130 miles of the more heavily used roads have bituminous surfaces, and funds recently have provided for adding about 10 miles each year.

The road improvement method used for the past fifteen years, consists of four elements as follows:

Firstly, drainage is corrected where necessary along the section of road selected for improvement. Culvert pipe, usually corrugated metal, is placed or replaced, and ditches are given a good cleaning out.

While everyone gives lip service to the need for good drainage, drainage sufficient to help keep a stable roadbed most of the year is required and definitely obtained in Wayne County. Roads in general are kept as well ditched as funds will permit, and despite the flat terrain and sometimes



★ Spreading cold-mix on an 11-mile project in Wayne County—September, 1950.
Note well compacted base.

heavy clay soil, road base thus drained are standing up well.)

Stabilized Gravel Base

Secondly, comes base preparation. The procedure is as follows, aimed at securing a stabilized gravel roadbed at least 6 to 9 inches thick and 18 to 20 ft. wide or wider. During late summer and fall the first 3-inch lift of gravel is placed on the road. Gravel is spread by a motor grader or a spreader box, or spilled by the trucks. Twice a week a multiple-blade maintainer covers the road, making one pass in each lane. During the winter or spring another lift of gravel is added, and the maintainer continues to make the rounds.

Then in June calcium chloride in flake form is applied at the rate of $1\frac{1}{2}$ lb. per sq. yd. of road surface. A special truck-mounted blower is used for the application, or sometimes the chloride is applied by a spinner. Maintainer passes are continued twice weekly, such maintenance at this time in the midst of traffic being considered of critical im-

portance. In a few weeks the base stabilization is considered complete and the road is ready for surfacing.

An exceptionally dense, tight base is usually achieved—one which will carry traffic with little raveling or dusting for a considerable period without any covering. But the plan is to begin applying black top immediately after three or four weeks of maintenance has worked in the chloride and produced a base of maximum density and stability.

Thirdly, plant-mixed emulsified asphalt and gravel is applied for a 2-in. mat. The mix consists of $13\frac{1}{2}$ gal. per ton of emulsified asphalt (AE-200 Indiana state highway specifications), and selected, well graded gravel screened for removal of over-size but not crushed. Proportioning and mixing are performed in a 500-ton-per-day movable plant leased from W. L. Magaw, contractor.

The surfacing procedure is as follows: The section to be surfaced is closed to traffic and the float of loose material tight bladed into small windrows at either edge of the road. Guide

stakes are driven on either side at about 100 ft. intervals, a few inches out from the edge of the surface. Working from these stakes a man with a paint bucket brushes yellow daubs at 10 or 15 ft. intervals along the line of the pavement edge. These daubs are sufficient to guide the spreading operations.

The bituminous mix is placed one lane at a time using a truck-drawn spreader box. Spreading is done along one lane for a day, the other lane the next day. About 1050 tons of mix is placed per mile of surface 18 ft. wide. As the mat is laid the windrowed base mulch is immediately thrown against the edge for protection.

The surface is given one roller

Moderate Sized Fleet

In addition to building up his organization, supervisor Coffin has seen a remarkable change in his equipment since coming on the job in 1935. That year found the county with virtually no modern equipment. Today the county's fleet includes the following units:

- 1 Northwest $\frac{3}{4}$ -yd. dragline with Page bucket (for gravel pit)
- 1 Caterpillar tractor and bulldozer
- 1 Barber-Greene bucket loader (gravel pit stockpile)
- 1 Overman material spreader (for placing cold mix)
- 1 Cold-mix plant (leased from contractor)
- 20 dump trucks (International, Duplex, other)
- 3 motor graders (various makes)
- 3 Adams multiple-blade maintainers
- 5 under-truck blades
- 1 Allis-Chalmers motor grader
- 1 Huber 8-ton tandem roller
- 1 rotary power broom

Miscellaneous equipment including air hammers, electric welders, acetylene welders, paint sprays, and shop equipment.



★ Getting an extremely hard, dense stabilized base is insisted upon.



★ Stakes and yellow paint daubs (see arrows) guide the spreading crew.

pass with an 8-ton tandem roller as soon as the material has set up, and another pass the next day, after which the section is thrown open to traffic.

Fourth, the job is sealed with emulsified asphalt, AE-150 state highway specification material. Sometimes, in order to protect the mat from marking by tractors or other traffic use, a light seal is applied immediately consisting of .2 gal. per sq. yd. followed by 12 lb. per sq. yd. of cover stone. Then a second seal is placed later, consisting of the regular application of .3 gal. and 18 lb. of chips. At other times the full .3-gal. treatment only is applied after several weeks of traffic use. Sealing work is contracted, the contractor applying the bitumen and county forces placing chips and rolling.

All bitumen roads are sealed every 3 or 4 years, usually with .3 gal. of AE-150 and 18 to 20 lb. of chips per sq. yd. Sealing jobs are immediately rolled. The cover material consists of a light grey limestone, 100% crushed, $\frac{3}{8}$ -in. maximum. This stone, purchased commercially, has been the standard for many years and has helped produce surfaces which not only wear excellently but also have a pleasing light-toned appearance.

An examination of sections of highway built by the foregoing method, varying from 5 to 16 years in age, were observed last summer and found to be in excellent condition. Not only are the surfaces tight but the roads ride well at high speeds—popular quality with road users. Some raveling has occurred here and there along the edges, due mostly to movement of farm tractors.

Wayne County has over 650 miles of graveled roads, and hence has far to go in progressively stabilizing these surfaces. Many miles of roads however will remain just graveled roads indefinitely, because of their light traffic. Some are only 12 to 16 ft. wide. This large mileage is given one pass each week with multiple-blade maintainers or under-body blades, the dragging being worked out in a routine with each operator covering a circuit. Each Monday morning the supervisor has placed on his desk a map of the county system, on which roads which have been dragged are shown in colored crayon. Rerouting of maintainers is done as deemed necessary to give best public service, but in general each section of road is dragged on about the same day each week.

Gravel for base lifts and also for the cold mix comes from a 50-acre pit of glacial material. This pit, centrally located and leased by the coun-



★ Gravel and emulsified asphalt are cold-mixed in this plant, located at the county's 50-acre pit.

ty, is one of the county road department's chief assets. Gravel and sand deposits are such that well graded material can be secured with little trouble. Oversize stones are screened out with a shop-built screen, made with $\frac{3}{8}$ -in. diam. cold-rolled bars set for 1-3/16-in. clear openings. Gravel taken from the pit by dragline, screened and stockpiled costs the county about 15 cents per ton, which is quite a bargain price for road metal.

While calcium chloride is used in stabilizing bases as a forerunner of bituminous surfacing, no general applications of chloride are used elsewhere as a dust layer, due to budget limitations. However, calcium chloride is locally applied past farm houses at the owners' request, and the owner charged for the materials at carload-lot rate per ton. The principal betterment expense for gravel type roads is the addition of new gravel, which progresses steadily.

Keep Eye on Fundamentals, Counsels Supervisor Coffin

The following remarks, related to the subject of the accompanying article, were made in a talk by road supervisor Ernest H. Coffin, of Wayne County, Indiana, before the Purdue Road School, Lafayette, Indiana, in 1949.

The original purpose was to construct a dustless, all weather road at a low cost . . . About all conceivable procedures were followed in the early days. One strange thing is that many of these first roads are still fulfilling the purpose for which they were constructed—that of being dustless all-weather roads. During this period (thirty years) much advancement has been made in the development of various bituminous materials, and today we have in our State Highway Systems, City Streets, and a few County Roads, some of the finest roads one could wish for. However, in later high-type construction, the original thought of

producing low-cost roads has been set aside . . . One of our upper-most consideration in the construction of dustless county roads is still the cost problem.

I have long since learned that a road that rides well, and stays free from holes, creates a much more favorable impression on the motoring public than anything else. They are not so much concerned (at the moment) whether the road cost \$1,000, \$2,000, or even \$5,000 per mile.

Of all the factors entering into the construction of a bituminous road, there is one point on which we all must agree—the road must have an adequate base, and proper drainage before any type of bituminous construction will hold up. Hence, starting with a good, pre-conditioned, well drained road is the prerequisite before I will start with the bituminous surface from pit-run gravel.



★ Mr. Coffin having a "light" moment with two veteran county employees—Richard Roby, general foreman (26 years' service), and Lawrence Moore, bridge foreman (27 years)

A County Highway Leader is Known by the Men He Keeps with Him

Following are excerpts from a paper, "Some Observations After Fifteen Years as a County Road Supervisor," given at the Purdue Road School, Lafayette, Indiana, April 17, 1950. The remarks were addressed to fellow supervisors.

By Ernest H. Coffin

Highway Road Supervisor, Wayne County, Indiana, Richmond

If any of us succeed to a marked degree, it will be because of the caliber of men working under our supervision. I presume the average Indiana county road department has 12 to 50 men on the regular payroll. Whether they be a few, or many, their efficiency will determine your success. In most cases you will act as a manager. It is your duty to train and organize these men and maintain as much harmony as possible. Your success, or failure, will be determined largely by your handling of this one problem.

Naturally, from this group, you will select certain leaders, trained for specific tasks. These men must not only have confidence in themselves, but they must have confidence in you. They will carry on in your absence. Very likely one man will be trained to carry the entire responsibility when you are off the job.

Good Working Conditions

It will be up to you to do all the planning, but the execution of these plans will be left to your men. If they are to fulfill this task in a creditable manner, it is up to you to provide all the things necessary to create in

these men an interest in their work and a desire to do a good job.

First, you should provide, as far as possible, good working conditions. You should provide, as far as possible, the best in modern equipment. It is only by the use of good equipment that we can overcome the high cost of labor, with which we are faced today. Keep this equipment in the best of condition. No man can take proper interest who has to work with worn-out and run-down equipment. This equipment of yours, as it goes up and down the road, speaks for you and your department in a publicity way. If it is obsolete, poorly maintained, or left standing along the road, it is creating a poor public impression of you and your department.

Provide working hours comparable to other working conditions in your community. Pay wages comparable for like work in your community.

See that your men have compensation insurance, in order that they may be taken care of, in case of accident. See that employees are protected with liability insurance. Accidents are bound to happen and someone is going to be held liable. It is your duty to provide these men with some protection.

Give your men a few days vacation, and a few of the holidays with pay. You take these days off. Why not give these advantages to your men?

If your men should elect to carry hospitalization insurance, to take care of themselves and their families, you can make this possible in providing withholding from their pay check and give them group protection.

Retirement Plan Urged

Under the present Indiana laws it is possible for you to provide for them a retirement plan. Public employees never have been protected by social security or any other means of providing for their future. The legislature of Indiana, sensing this condition, provided this law whereby all public employees could participate in a retirement fund plan. It provides a Public Employees Retirement Fund and now is in full operation in Indiana. All public employees in the state are permitted to participate in this plan. Your highway department should be in it for your employees' security.

Your department is taken into this plan, by vote from your county council. It provides a minimum retirement age of 55 years, and a *must* retirement at 70. It provides for a mini-



★ A delegation of officials from surrounding Indiana counties is seen here inspecting Wayne County method

WEST VIRGINIA SOLVING ROAD BUDGET PROBLEM WITH SEAMAN MIXERS!

The Charleston Gazette
"To Get More Roads" Column

Charleston Gazette in editorial points to Seaman as answer to road system extension . . .

The Charleston Gazette, quite properly, does not mention the SEAMAN by name, calling it only a "road-building machine," but the story is about seven SEAMAN MIXERS now in use by West Virginia. In part, here's what the Gazette says:

"Here is an answer to the prayers of those dwellers in West Virginia hills who are harassed by their inability to get in and out the greater part of the year. Our many miles of dirt roads — often no better than mud roads — are the cause of continual complaints . . .

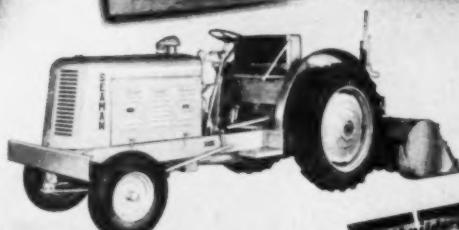
"We have gone into the matter of the road building machine and have found much to rec-

ommend it — low price, low cost of operation and speed in road construction. The result of the investigation was startling.

"The machine goes over the old road . . . mixes the old material and applies a binder, lays it back down and smoothes it out. A following roller compacts it and the job is done.

". . . It is stated that the cost of construction of this type of road is approximately one-fourth that of the old method . . ."

West Virginia's experience with the SEAMAN MIXER is duplicated the country over. The SEAMAN is by far the best answer to high quality, low cost stabilized roads.



The SEAMAN SELF-PROPELLED MIXER 7 ft. mixing width. Gasoline or Diesel powered.



The SEAMAN SELF-PROPELLED TRAV-L-PLANT. Like the Self-Propelled Mixer except for addition of spray bar, pump, pump tachometer, fifth wheel assembly and meter for precision control of bitumen or water application. 7 ft. mixing width. Gasoline or diesel powered.

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Hot-Shipped Asphalt

Aids Air Force Runway Maintenance Crew

Higher penetration asphalt found preferable for variety of operations. Accelerated tests prove value of asphaltic sub-sealing

SHIPMENT of hot asphalt by tank car is opening new uses for this product in the maintenance and rehabilitation of Air Force runways. Undersealing concrete airfield pavements with low penetration asphalt cement is a standard practice for correction of pumping joints and rocking slabs. This was formerly accomplished by using packaged roofing asphalts which were chopped up and melted in ordinary asphalt kettles from which the asphalt was laboriously pumped under the pavement.

The shipment of asphalt from the refinery at temperatures of 450 to 500 degrees Fahrenheit has so expedited this work that production has been multiplied tenfold and costs have been reduced considerably.

In view of the reduced cost and the speed of the work, undersealing was extended to include entire sections of pavement where it was suspected that voids existed between the pavement and subgrade. This reestablishes uniform pavement contracts at all points and places a waterproof membrane over the entire subgrade. Raising slight depressions in the pavement by pumping sufficient asphalt to jack the pavement to grade has also become common practice.

Subsealing a Policy

Recent accelerated traffic tests on runways treated in this manner have been so successful that the subsealing of concrete runways by this process has become a fixed policy in the Air

Force as a preventive maintenance measure. The concrete runways and parking aprons of four major bases of the Air Training Command have been subsealed for preventive maintenance during the recent construction season (1950) and similar work is being planned for several more major bases.

Higher Penetration Preferred

Some asphalts are still used in sealing of joints in concrete airfield pavement. Most of this work is now done with asphaltic base rubberized compounds and tar base rubberized compound for jet fuel resistance. However, where joints have been previously filled with asphalt, maintenance is carried on with similar materials.

It has been found that sealing of joints on airfield pavements is much more successful and longer lasting when higher penetrations asphalts are used. Higher penetration asphalts retain their ductility and do not break bond with the concrete as quickly as

(Continued from page 80)
num of 15 years service, according to the age of the employee. All prior service is considered in determining the amount of retirement income. This is a joint program whereby the employee pays 5% of his wages, not to exceed \$90 per year, and the county pays a similar amount, including all prior service. This is made optional for your present employees. But when the program is entered into, it becomes compulsory for all new employees.

You should practice economy in all

your highway dealings. You should use local materials whenever possible. But when you pinch your employees on wages below those customary in your community, when you fail to give them needed protection in insurance, when you refuse to give your men vacations and holidays with pay, and when you refuse or neglect to provide for their future security, you are practicing false economy.

Many of you have worked with horses. Did you cut down on their feed and expect a day's work? Most all of you drive good cars. Do you

buy the lowest price gasoline, or do you tell that station agent to put me in a quart of 15c oil? When you fail, or neglect to provide for your employees, you are practicing this same type of economy.

I know it is discouraging, when one realizes that the average age of service of a county highway supervisor is only about three and one-half years. Likely, with the turnover we have this year, that figure will be lower. This is something neither you nor I can help. I hope some time in the future this will be different.



★ Corrugated pipe installation progresses at the rate of about 50 culverts per year in Wayne County



★ Road supervisor Ernest H. Coffin with contractor W. L. Magaw

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Blending with every landscape and free from glare, roads built with Tarvia* road tar take the strain out of driving. They are self-healing under impacting traffic.



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- 4 TARVIA road tar is unaffected by gasoline, kerosene, or moisture. It retains its original properties.
- 5 TARVIA road tar holds the aggregate tightly in the surface, and produces a gritty surface which is lastingly skid-resistant.
- 6 TARVIA road tar may be applied at moderate temperatures, and with ordinary equipment.

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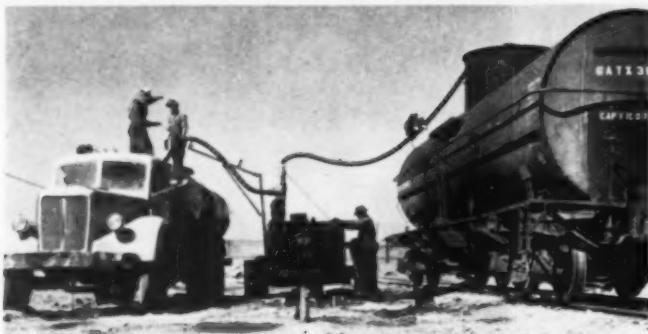
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★ Transferring asphalt from tank car to truck

do the lower penetration asphalts.

Similarly, it has been found that the

use of higher penetration asphalt on runway surface treatment work and

other features of runway construction and maintenance is much more satisfactory than the lower penetration asphalts commonly used in highway work.

Airfield pavements get only a small percentage of wheel traffic in comparison to highway surfaces and are therefore not subjected to the continuous kneading that the highway surface gets. Because the higher penetration asphalts tend to remain ductile, they maintain a moisture proof surface for a much longer time.

To replace the wheel traffic that highways get every day, runway maintenance crews roll asphalt treated runways with pneumatic tired rollers at least twice a year in order to liven up the surface and knead out the hairline cracks that might be developing.

Heater Dries Stone in Trench for Widening Project

Use of an oil burner for drying stone previously laid in widening trenches, is a feature of a widening and resurfacing project completed during 1950 by Masters-Jackson Paving Co., Springfield, Mo. The project was on U. S. 66 in Missouri. The 30-inch widening strip shown here consisted of stone base

rolled in a prepared trench, followed by asphaltic concrete up to level of the existing pavement, and subsequent re-paving full width with hot-mixed asphaltic concrete.

Photos courtesy Associated General Contractors of Missouri, which has

published an account of this project as an example of a highway modernization project performed by contract, and subjected to the Missouri state highway department's rigid inspection and tests—a means of giving the public fullest value for its highway tax dollar.



★ Showing fuel oil burner attachment devised by Missouri contractor to overhang a widening trench and dry base stone already in place



★ Following the stone lift, asphaltic concrete was placed to pavement height using a special box on the end of a spreader



★ A trench roller thoroughly compacted both the stone base and the asphaltic concrete



★ Masters-Jackson Paving Company's hot mix plant, which supplied mix for both widening and resurfacing

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Consider, for example, Tarmac's ability to coat the aggregate rapidly and thoroughly, thus reducing mixing time. Plus its ability to penetrate right on through dust or moisture, so

that there's no need for highway crews to remain idle while waiting for the "right" weather. Important, too, is the way Tarmac resists the stripping action of water, without the use and the extra cost of additives.

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Tarmac MAKES BETTER ROADS



★ Pulverizing and mixing, together with thorough rolling, was the key to economical stone base for widening.



Widening Old Single-Lane

PAVEMENTS WITH STONE MACADAM

Champaign County, Illinois, employs pulverizing mixer as part of a "new old" method of widening narrow pavements

By R. F. Fisher

County Superintendent of Highways,
Urbana, Illinois

PAINLESS to the public pocketbook is the answer sought to pavement widening in Champaign County, Illinois. A county wide system of single traffic lane pavements which are only 9 feet wide has served traffic for a generation and more. In these modern times, of course, these pavements have served with ever increasing inadequacy. The problem has been how to utilize existing pavement and at the same time develop an economical type of widening which would hold future maintenance costs to a minimum.

8½-Mile Project

Crushed stone macadam was elected in this case to be the answer to the public's prayer for higher speed, safer movement of the ever-growing traffic volume. To many people the picture of costly keying and interlocking of crushed stone and the slow handbrooming of fines which the term "macadam" brings to mind, is hardly consistent with being painless to the public pocketbook. But it is, for a new method of macadam construction develops a pavement believed superior to that placed the old way. And the contractor has saved substantially on man-hours of labor required on work done to date, indicating that savings might accrue to the county on later work.

On an 8.4 mile stretch of the outgrown system, running from Urbana to Philo, construction started by removing old shoulder material to sub-grade level. The subgrade was then bladed to grade and made firm by rolling. A layer of crushed stone was spread in a 12-ft. strip on one side of the existing 9-ft. pavement, in an amount sufficient to produce a 4-in. thickness when compacted. This was shaped to an even surface. Water was then applied to the stone in an amount sufficient to give all surfaces of the aggregate a moisture film. But now, here's where the new stunt comes in.

A motorized rotary mixer (Seaman Pulvi-Mixer) was put to work on the loose, moisture coated, crushed gravel. In one passage of the mixer the action of the machine's rotating tines operating within the confines of a hood automatically dispersed and blended the aggregates prime for keying and interlocking under compaction. The trailing edge of the hood not only kept the treatment level but uniformly dispersed the fines between the coarse aggregates far better than hand brooming could have done. There was no tendency whatever for the aggregates to collect into uneven and separate pockets of coarse and fines.

After the mixer had traversed the first layer of stone, a second layer of the same volume was laid, bladed to an even surface, moisture added,—and again, the mixer was put to work. As

before, only one pass of the machine was needed to get an excellent integration of the coarse and fines.

No further blading was needed before compaction operations started since the mixer's trailing edge acted as an efficient strike-off to keep the treatment level.

Mix Compacted Well

Compaction was accomplished, first, by a pneumatic roller; and last, by steel-wheeled rollers. This combination caused all the well-distributed fines to ooze into and fill all voids between the coarser stones so that the close keying, interlocking and knitting together of the coarse and fines resulted in a pavement of exceptional density and watertightness.

On completion of the macadam base the old pavement as well as the new base was given a 2 in. bituminous surfacing of Illinois specifications Sub-class B-3, 20 ft. in width.

The entire job, advertised for letting in summer, 1949, was completed in a month's time by the Champaign Asphalt Company, Champaign, Illinois. The work was done under the joint supervision of the engineering staffs of Champaign County and the State of Illinois.

Macadam base construction by the method described has great promise for exceptionally low cost, high load bearing, weather resistant county roads. Certainly, Champaign County has room for many miles more of the construction first developed by Mr. McAdam so many years ago.



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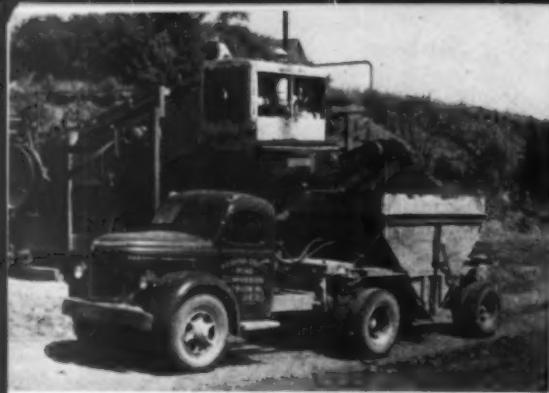
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★ One of Houghton County's gravel hoppers spreading a 4 or 5 inch lift and back at the pit for another load



Big Spreading Hoppers Cut County Road Graveling Costs

A FAMILIAR sight in summertime on the roads of Houghton County, in Upper Michigan, is the county's fleet of big "hopper" trailers. These units, of which the county presently has nine, have served for the past ten years. During this time they have carried the bulk of the maintenance

gravel, and probably in this period have helped place a quarter-million cubic yards of material on the roads.

The units were built by the Houghton County highway shop force. Each unit consists of a sheet steel hopper of V-shape, set in a semi-trailer frame. Front and rear hopper gates

are sprung open or shut by latches operated from the driver's seat. The hoppers have dual rear tires and are designed to be drawn by any trailer truck.

The gates can be opened quite wide when necessary, to pass large boulders. But ordinarily in handling gravel the gates are set by a chain latch to an opening such that crushed gravel of 1-in. max. size flows out at a proper rate for spreading as a 1½ to 3 in. lift. A 3-in. gravel lift 20 ft. wide calls for 977 cu. yd. of material per mile, for example, or 18½ cu. yd. per station. Or a 1½-in. lift takes

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2. "Balanced" Piston type control valve non binding, free action, sleep proof.

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4. Double Arm "Power-Speed" lift—Power hoistages change to speed for faster dumping cycle.

5. Double shaft stabilizes lift, permits flexibility, adds life to haulage.

6. Marine rear body braces greater strength.

7. 3 Pivoted Braces on sides supports larger nests.

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10. Extra large Piston Shaft gives greater protection and strength needed for "Jouncing" operations.

11. Cylinder, stainless steel, fitted with blow-out Proof Cylinder head.

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Produce for immediate hot laying, or for deferred cold patching. Match any bituminous surface.

Mixes at plant, including labor, fuel, and overhead, cost about \$4 per ton, with \$2 aggregate. Average 160 to 200 sq. yds. 1" thick per hour. A money-maker for small contract work.

Also larger plants, 15 and 30 tons per hour.

Write for catalog and name of nearest dealer.

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about 500 cu. yd. per mile or 9½ cu. yd. per station. An 8-yd. load spread along a 100 ft. station gives about 1½ in. thickness. The drivers learn to gauge their truck speed and gate openings accurately, so that when a windrow is spread out by the motor grader it gives the desired thickness of new floating mat with fewest grader passes.

The hoppers also are put to another use, namely, to spread sand in a very thin "film" to fill voids in the cover stone following bituminous sealing. The cover material is first placed and thoroughly rolled. Then the driver of the hopper travels along at 15 to 20 mph. with his gates opened only a fraction of an inch. He can cut off the application while in transit, if need be. Stamp sand from the local copper smelters or rock sand is commonly used. No further spreading or dragging of any kind is necessary.

The hoppers have proved economical for several reasons. They haul twice the load of an ordinary dump truck, with less load on tires. Fewer drivers are required, and only half the truck mileage. The County cost sheets show that gravel can be laid down on the road for less than 5 cents per ton-mile today, whereas the going price for hired dump trucks is about 10 cents.

Sometimes the hoppers do the spreading, but at other times it is more economical to deliver only to one end of the job. The County has an elevator-bucket type car unloader which is used to transfer the hopper contents to dump trucks as the hoppers arrive at one end of the project. The car unloader belt is run under the hopper, the material fed onto the belt and into waiting trucks in a couple of minutes' time. The trucks then "tail gate" to a conventional push-type material spreader.

The accompanying photos show the hopper units in action, August, 1950, drawn by Reo trucks and loaded from the County's portable aggregate plant, a Diamond unit with Caterpillar engine power, the plant (not shown in picture) also includes a Barber-Greene 40-ft. belt and a Diamond feeder. A Northwest ½-yd. shovel fed the plant.

Carl F. Winkler is County Highway Engineer of Houghton County, Michigan.

Program of Asphalt Paving Technologists

Following tentatively is the program of papers scheduled for the annual meeting of the Association of

Asphalt Paving technologists, to be held in Denver, February 5, 6, and 7. Other papers also will probably be included, according to Association Secretary Ward K. Parr. The Association's headquarters is located at 1224 East Engineering Building, Ann Arbor, Michigan.

1. "An Improved Triaxial Cell for Testing Bituminous Mixtures." C. A. Carpenter, J. F. Goode and R. A. Peck, Bureau of Public Roads.

2. "Viscosity Effects in the Marshall Stability Test." J. A. Lettier and D. F. Fink, Shell Oil Company.

3. "Asphalt Embrittlement in Over-Heated Plant Mixes." D. E. Stevens,

Stancal Asphalt & Bituminous Co. and B. Jameyson, California Research Corp.

4. "A Preliminary Evaluation of Load Transmission Test Data." W. M. Aldous, C. A. A.

5. "Properties of Shale-Oil Asphalts from Colorado Shale Oil." W. C. Kommes and K. E. Stanfield, Bureau of Mines.

6. "Sealcoating Aggregates." H. G. Nevitt, Socony-Vacuum Oil Company.

7. "Design of Asphaltic Concrete Mixtures for Washington State Highways." J. L. Stackhouse, Washington Department of Highways.

8. "Effects of High Pressure Tires



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The Moto-Paver provides a highly efficient method of paving and resurfacing roads and streets. With this self-propelled machine, the mixing and laying of a cold bituminous mat is accomplished in one continuous operation. Uniformity of mix and a smooth riding surface are assured. The Moto-Paver has been successfully operated using gravel, stone or slag aggregates, and with most types of emulsions including RC, MC and SC asphalt and tars. Its mobility, together with the small operating crew and the minimum amount of auxiliary equipment required, make the Moto-Paver ideal for out-of-the-way jobs and maintenance, as well as for new construction. Bulletin MP-49 gives complete information.



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on Bituminous Pavements." J. M. Griffith, Corps of Engineers.

9. "Physical Interpretation of Tri-axial Test Data." R. G. Hennes, University of Washington.

10. "Recent Developments in the Measurement of Road Roughness and Skid Resistance." R. A. Moyer, University of California.

11. "Laboratory Compaction Methods for Asphaltic Mixtures." B. A. Vallerga, University of California.

12. "Development of Instructional Facilities and Curricula for Study of Asphaltic Materials." B. A. Vallerga, University of California.

13. "Penetration Test Measures Hardness of Asphalt." Roland Vokac, Husky Oil Company.

14. "Definitions of the Physical Properties of Asphalts and Their Relationships." L. W. Corbett and Roland Vokac, Husky Oil Company.

15. "Latin Square Design of Experiments Involving Asphalt." Frank B. Odasz, Husky Oil Company.

AED Meeting Expects Record Attendance

Construction equipment distributors and manufacturers from throughout

the United States and Canada will convene in Chicago next month (January) for the 32nd Annual Meeting of Associated Equipment Distributors, to be held Jan. 28-Feb. 1 at the Stevens Hotel.

More than 1600 members had registered by early December, according to the Association's executive office. In addition, nearly 200 wives of members had registered. Over 430 distributor and 225 manufacturer companies have been registered. All previous attendance records appeared certain to be eclipsed.

Highlighting the program will be a series of panel and forum discussions touching on a wide variety of industry problems. Distributors' panels are scheduled for Monday afternoon, Jan. 29 and morning of Feb. 1.

Among the speakers at 1951's Annual Meeting will be Admiral Cotter of Merrill, Chapman & Scott and General Eugene Reybold, Executive Vice-President of the American Road Builders Association.

The Joint Distributor-Manufacturer panel, instituted at the 1949 meeting, will include six distributor members and six manufacturer members, who will discuss questions submitted by members at the final session on Thursday, February 1st. Kenneth Lindsay, Iowa Manufacturing Company, will serve as chairman, and Tom Callaway, Goodyear Tire and Rubber Company, will act as panel moderator. The theme will be "Development and Retention of Markets for Construction Equipment."

Another popular convention feature will be the arrangements provided for individual conferences between distributors and manufacturers in attendance. All of Tuesday and Wednesday afternoon, Jan. 30 and 31, are reserved for such contacts.

Meetings Ahead

CALIFORNIA CONFERENCE ON STREET AND HIGHWAY PROBLEMS, held by Institute of Transportation and Traffic Engineering, University of California — Campus at Berkeley, Calif.; Jan. 24-26.

ASSOCIATED EQUIPMENT DISTRIBUTORS, INC., Annual Convention—Stevens Hotel, Chicago; Jan. 28-Feb. 1.

ASSOCIATION OF ASPHALT PAVING TECHNOLOGISTS, Annual Meeting — Denver, Colo.; Feb. 5-7.

AMERICAN CONCRETE INSTITUTE, Annual Meeting—St. Francis Hotel, San Francisco; Feb. 20-24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, Spring Meeting — Houston, Texas; Feb. 21-23.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC., Annual Convention—Statler Hotel, Boston, Mass.; Feb. 26-March 1.

AMERICAN ROAD BUILDERS' ASSOCIATION, Annual Convention—Schroeder Hotel, Milwaukee, Wis.; March 12-14.

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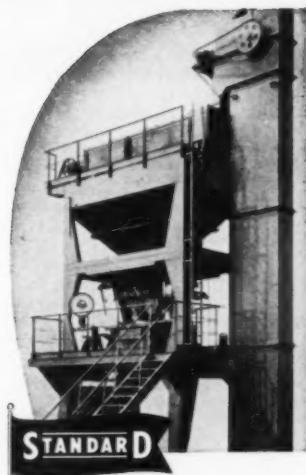
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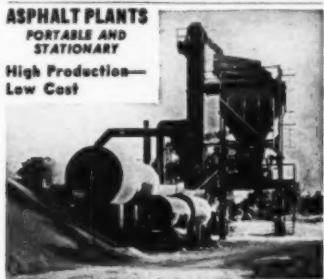
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New Buffalo-Springfield Appointment. Harold C. Clark has been appointed Eastern District sales representative for the Buffalo-Springfield Roller Co., Springfield, O., with headquarters in Harrisburg, Pa. He will have in his territory 18 states in the Eastern section of the country. Mr. Clark has had wide experience in the construction equipment field, including 12 years with Cleaver Brothers Co. as sales manager and more recently, three years with Rosco Manufacturing company.



H. C. Clark

J. D. Adams Promotes Cline. E. L. Cline has been appointed western division sales manager for J. D. Adams Manufacturing Co., Indianapolis, Ind. He will be in charge of all sales activities in a territory comprising all of the states west of the Mississippi River, plus the states of Wisconsin, the Upper Peninsula of Michigan and part of Illinois. Mr. Cline joined the Adams organization in October 1926, and after working several years in the Adams Advertising and Sales Promotion Division, he was transferred to Sales.



E. L. Cline

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2. For information on particular products advertised in this issue, use Part "A" of the bound-in cards.

3. Part "B" of the cards is also usable for further information on any items described in the "New Equipment and Materials" or "Manufacturers Literature" sections of the magazine.

A

7201	Acetylene Gas	2002	Cement, Asphaltic
2001	Additives, Bituminous	3002	Cement, Portland
7001	Agitator Bodies, Truck	3003	Cement, Quick-Setting
6201	Air Cleaners	3004	Cement, White
1001	Air Compressors	3205	Centering, Concrete Arch
1002	Air Comp., Self-Propelled	3005	Center Strip Materials,
1003	Air Tool Accessories	1206	Road
3201	Anchor Rods (Bridge)	7401	Chain
3202	Arches, Corrugated Metal	2811	Chain, Conveyor
2002	Asphalt Cement	2811	Chutes, Concrete and Dry
2003	Asphalt, Emulsion	2811	Material
2004	Asphalt, Liquid	6406	Cleaning Equipment,
2005	Asphalt, Powdered	2602	Tractor-Mounted
7002	Axes, Truck	3601	Cleaning Solvents

B

6801	Backfillers	3206	Connectors, Timber
1004	Backfill Tampers	3006	Contraction Plates
1401	Batchers, Agg. & Cement	5405	Control Equip., Cable
3602	Batchers, Cement	4004	Control Equipment, Hy-
2801	Batchers, Water	2815	draulic.
6202	Batteries, Elec. Storage	1205	Conveyors, Belt
4601	Beads, Glass Reflecting	4802	Cranes, Crawler-Mounted
7601	Bearings, Roller	4803	Cranes, Hydraulic
6001	Belting, Conveyor	6407	Cranes, Tractor-Mounted
2804	Belts, Concrete-Finishing	4804	Cranes, Trailing, 2-Wheel
2805	Benders, Bar	4805	Cranes, Truck-Mounted
2806	Bins and Hoppers	4806	Cranes, Wheel-Mounted
1007	Bits, Drill: Sharpeners	6408	Crawler Tracks
1005	Bits, Rock Drill	3219	Cribbing, Retaining Wall
1602	Bitum. Hot Patch Units	1218	Crushers, Gyrotary
2201	Blades, Grader, Loader	1207	Crushers, Jaw
5601	Blades, Toothed (Ice Re-	1202	Crushers, Roll
6601	Block and Tackle	3207	Culvert Cleaning Tools
2601	Block Machines, Concrete	3208	Culverts, Corrug. Metal
3203	Boat Spikes & Drift Pins	2618	Curb and Gutter Machine
7001	Bodies, Agitating	2604	Curing Machines, Con-
7003	Bodies, Dump	3007	crete (Spray)
7004	Bodies, Flated	3007	Curing Materials, Con-
7005	Bodies, Garbage Col.	2813	crete, Bar and Rod
7006	Bodies, Pick-up	4001	Cylinders, Hydraulic
7602	Booms, Special		
1203	Breakers, Impact		
1006	Breakers, Pavement		
2807	Bridges, Float	3210	Decking, Bridge (Open
2204	Bridges, Suspension		and Solid)
1806	Brooms, Drag	7606	Derricks
1807	Brooms, Road	2408	Dippers, Shovel
2401	Buckets, Cableway	1802	Distributors, Bituminous
2402	Buckets, Clamshell	3008	Dowels and Assemblies
2403	Buckets, Clamshell (Hy-	4807	Draglines, Walking
2404	Buckets, Concrete	1215	Drags, Sand
2405	Buckets, Dragline	5002	Dredges and Dredging
2406	Buckets, Dredge		Mchy.
2808	Buggies and Carts, Cone.	1201	Driers, Aggregate
7604	Buildings, Demountable	3401	Drills, Cable Tool (Well)
6405	Bulldozers	3402	Drills, Core
6401	Bulldozers, Angling	3403	Drills, Earth-Boring
6404	Bulldozers for Motor	1016	Drills, Electric
Graders		3404	Drills, Electric Hammer
		1009	Drills, Rock (Hand-Held)
		1010	Drills, Rock (Tripod)
		1011	Drills, Rock (Wagon)

C

7605	Cars, Industrial Railway	1210	Elevators, Bucket
5801	Carts, Street-Cleaning	2814	Elevators, Cement (Bulk)
1204	Car Unloaders	4602	Enamels, Equip. and Sign
2407	Castings and Parts, Man-	6203	Engines, Diesel
3001	ganese Steel	6204	Engines, Distillate
Cement, Air-Entraining		6205	Engines, Gasoline
Portland			

E

6602	Excavators, Slackline Ca-
	bleway

F

3009	Fabric, Welded Wire
1211	Feeders, Aggregate
2006	Felt, Subgrade (Elastic)
7402	Fencing, Wire
4201	Filing Systems
2605	Finegraders (Subgraders)
1809	Finishers (Pavers), Bi-
	tuminous
2606	Finishers, Vibrating
2607	Finishing Machines, Con-
	crete
7403	Fittings, Wire Rope
4401	Flares (Torches)
4005	Fluid, Hydraulic
5802	Flushers, Street
2007	Flux, Asphalt
7007	Fork Trucks
2815	Forms, Catch Basin and
	Manhole (Concrete)
2815	Forms, Concrete Con-
	struction
2817	Forms, Curb, Road and
	Sidewalk (Concrete)
3603	Fuel, Diesel and Gasoline

G

3212	Gates, Drainage
1214	Generator Sets, Engine
1810	Generators, Steam
3801	Graders, Elevating
3803	Graders, Motor
2602	Graders, Pull-Type
3604	Graphite
2409	Grapples
3405	Grinders, Concrete-Surf.
1212	Grizzlies
3213	Guard Rails

H

7202	Hard-Facing Rods
1813	Heaters, Pavement-Sur-
	face
1814	Heaters, Tank Car (Bitu-
	minous)
1815	Heaters, Tool (Bitum.)
1816	Heaters, Torch
2819	Heaters, Water
6002	Hose, Air
6003	Hose, Cement-Handling
6004	Hose Couplings
6005	Hose, Metal (Flexible)
6006	Hose, Suction
6007	Hose, Water

J

4006	Jacks, Hydraulic
2608	Joint-Cleaning Machines
2609	Joint Installing Machines
3010	Joint Plates, Base (Wa-
	terproof)
3011	Joint-Sealing Compounds
3012	Joints, Pavement

K

1803	Kettles, Bituminous
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L

4403	Lanterns
5803	Leaf-Collecting Machines
4404	Lights, Acetylene
4402	Lights, Flood
4405	Lights, Flood (for Equip-
	ment)
4406	Lights, Warning (Elec-
	tric)
7608	Liner Plates, Tunnel
7609	Linings, Brake and
	Clutch
2202	Lips, Bucket
5402	Loaders, Elevating, Belt
	Type
5401	Loaders, Bucket
5403	Loaders, Front-End
5404	Loaders, Truck-Mounted
3605	Lubricants
3606	Lubricants, Compressor
	and Air Tool
3607	Lubricants, Diesel Engine
3608	Lubricants, Grease and
	Oil (Engine)
3609	Lubricants, Wire Rope

M

4809	Magnets, Lifting
3805	Maintainers, Pull-Type
3804	Maintainers, Under-
	Tractor
3806	Maintainers, Under-
	Truck
7610	Melting Pots, Lead
1811	Mills, Grinding (Asphalt)
3604	Graphite
2409	Grapples
3405	Grinders, Concrete-Surf.
1212	Grizzlies
3213	Guard Rails

O

1013	Oilers, Air-Line Air-Tool
5003	Packing, Pump and Valve
4605	Paints, Priming
4603	Paints, Rust-Preventive
4604	Paint Sprayers and Com-
	pressors
4608	Paints, Traffic line
4606	Paints, Traffic Line Mark-
	ing (Reflecting)
2613	Pavers, Concrete
3214	Pile Drivers
3221	Pile Hammers
3216	Piling, Bridge and Found.
3215	Piling, Steel-Sheet
3211	Pipe, Drainage (Perf.)
5001	Pipe, Dredge
3217	Pipe-Joint Materials
2008	Plank, Asphalt
1818	Plants, Asphalt (Emulsi-
	fied)
2802	Plants, Batching (Conc.)
2803	Plants, Batching (Low-
	Bin, Portable)

(List continued on opposite page)

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Page. _____ by. _____ Page. _____ by. _____

Page. _____ by. _____ Page. _____ by. _____

More new equipment information or trade literature on items circled:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
B	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	

Catalogs describing the following products listed on opposite and following right-hand pages:

C

My Name. _____ My Title. _____

My Firm or Govt. Dept. _____

St. Add. _____ City. _____ State. _____

ENTER ORDER and bill me for 1 yr. to ROADS & STREETS at \$5.00

Information about the products advertised on:

Page. _____ by. _____ Page. _____ by. _____

Page. _____ by. _____ Page. _____ by. _____

Page. _____ by. _____ Page. _____ by. _____

More new equipment information or trade literature on items circled:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
B	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	

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Page. _____ by. _____ Page. _____ by. _____

Page. _____ by. _____ Page. _____ by. _____

Page. _____ by. _____ Page. _____ by. _____

More new equipment information or trade literature on items circled:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
B	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	

Catalogs describing the following products listed on opposite and following right-hand pages:

C

1-51-85

A NEW LEAF FOR YOU TO TURN OVER!

Right Now!

Postage
Will be Paid
by
Addressee

No
Postage Stamp
Necessary
If Mailed in the
United States

BUSINESS REPLY CARD

First Class Permit No. 52, Sec. 510, P. L. & R., Chicago, Ill.

ROADS AND STREETS

22 WEST MAPLE STREET

CHICAGO 10, ILLINOIS

Postage
Will be Paid
by
Addressee

No
Postage Stamp
Necessary
If Mailed in the
United States

BUSINESS REPLY CARD

First Class Permit No. 52, Sec. 510, P. L. & R., Chicago, Ill.

ROADS AND STREETS

22 WEST MAPLE STREET

CHICAGO 10, ILLINOIS

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No
Postage Stamp
Necessary
If Mailed in the
United States

BUSINESS REPLY CARD

First Class Permit No. 52, Sec. 510, P. L. & R., Chicago, Ill.

ROADS AND STREETS

22 WEST MAPLE STREET

CHICAGO 10, ILLINOIS

On the reverse side of this sheet is an opportunity for you to get quickly, efficiently and economically all the information you may need about:

- A** Products advertised in this issue of Roads and Streets,
- B** New equipment described in it or new trade literature mentioned, or
- C** Any other products—machinery, equipment, materials or supplies—that may interest you. A suggestive list—specially compiled and arranged for your convenience—appears on the opposite and next preceding left-hand pages. Consult it.

The Readers' Service Department of Roads and Streets is ready to help you now or at any other time, and as frequently as your needs may require. Do not hesitate to make full use of it; you will not be obligated in any way.

So, turn this leaf now and let us start helping you today.

Readers' Service Dept.
ROADS AND STREETS
22 West Maple Street
Chicago 10, Illinois

Quick Help on Product Information

1804	Plants Bituminous (Portable)	R	2411	Skullcrackers	2822	Towers, Material-Hoisting	
1801	Plants, Bituminous (Stationary)	3808	Rake Attachments for Graders	5602	Snow Fencing	7613	Track, Industrial-Railway
1803	Plants, Bitum. Travel	6008	Reels, Hose	5603	Snow Loaders	6208	Tractors, Crawler
2809	Plants, Cement (Bulk; Portable)	3014	Reinforcing Bar Accessories	5604	Snow Plows, Blade and V-Type	6209	Tractors, Wheel
2812	Plants, Concrete-Mixing (Portable)	2203	Rippers and Rooters	5605	Snow Plows, Rotary	4609	Traffic Line Marking Machines
2810	Plants, Concrete-Mixing (Stationary)	1014	Riveters and Chippers, Pneumatic	5606	Snow Plows, Rotary (for Motor Graders)	6603	Trailers, Flatbed
1208	Plants, Crushing and Screening (Portable)	5206	Rollers, Single Drum	5607	Snow Plows, Sidewalk	6604	Trailers, Tilting
1209	Plants, Crushing and Screening (Stationary)	1801	Rollers, Grid-Type	4202	Soil Sampling and Testing Sets	6605	Tramways, Aerial
5405	Power Control Units, Cables	5202	Rollers, Pneumatic-Tired	5208	Soil-Stabilizing Eqpt.	6802	Trenching Machines
5004	Power Plants, Portable	5204	Rollers, Tandem	1820	Spray Bar, Bituminous	2616	Truck Mixers
7008	Power Take-Offs, Truck	5203	Rollers, Sheepfoot	1805	Sprayers, Bit, Hand	7011	Trucks, Motor
6206	Power Units	5205	Rollers, 3-Wheel	2615	Spreaders, Concrete	7007	Trucks, Industrial (Fork)
3218	Preservatives, Wood	5207	Rollers, Trench	1404	Spreaders, Dry Material	7012	Trucks, Off-the-Highway
3406	Pressees, Crawler Track Pin	2010	Rubber Road Materials	5805	Sprinklers, Street	7614	Tubing, Steel (Seamless)
4801	Pull Shovels (Backhoes)	6207	Rust Preventives, Engine	2412	Steel, Alloy		
6403	Pull Shovels, Tractor-Mounted	2820	Salamanders	3015	Steel, Concrete-Reinforce.	3220	Underpasses, Pedestrian and Livestock
6402	Pull Shovels, Trailing, 2-Wheel	1804	Sandals, Bitum. Paving	1008	Steel, Drill		
1213	Pulverizers, Hammer	4607	Sand Blasters	7404	Steel, Structural		
5005	Pumps, Bituminous	3408	Saw Rigs	4203	Surveying Instruments		
5014	Pumps, Centrifugal (Portable)	3407	Saws, Chain	5804	Sweepers, Street		
5006	Pumps, Centrifugal (Stationary)	1402	Scales, Weigh-Batcher				
5007	Pumps, Diaphragm	1403	Scales, Wheelbarrow	4812	Tagline Controls		
5008	Pumps, Displacement	2204	Scarfifiers	7010	Tail Gates, Elevating		
5009	Pumps, Dredge	5407	Scrapers, Drawn	1819	Tanks, Relay and Storage (Bituminous)		
5010	Pumps, Gear	5406	Scrapers, Self-Propelled	7612	Tarpaulins		
5011	Pumps, Grease and Oil	2821	Screeds, Concrete	2009	Tar, Road		
5012	Pumps, Hydraulic	2614	Scredders, Vibrating	2205	Teeth, Bucket, Ripper, Scarifier, etc.		
5013	Pumps, Jetting	1216	Screens, Vibrating	3016	Tie Rods		
5016	Pumps, Pneumatic	3809	Scythes, Power	6009	Tires, Construction		
5015	Pumps, Rotary	6011	Shafts, Flexible	6010	Tires, Truck		
		2410	Sheaves and Pulleys, Wire Rope	3409	Tool Carts		
		4810	Shovels, Crawler-Mounted	1812	Tools, Hand (Bituminous)		
		6409	Shovels, Tractor-Mounted	2818	Tools, Hand (Concrete)		
		7009	Shovels, Truck-Mounted	3410	Tools, Mechanic's (Construction and Equip.)		
		7615	Sign Painting Eqpt.				
		7611	Signs, Road				
		4811	Skimmers				

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 92. Each item is numbered. Just circle the corresponding number on the card and mail.

(Continued from page 73)

22

Spray Gun Spurting Eliminated

A new pump, announced by Gray Co., Inc., Minneapolis, Minn., is claimed to completely eliminate spray gun spurting, which often projects a blob of heavy industrial material upon the coated surface. This new air-operated, high volume, material handling pump is equipped

with a device called the Evenflo, which is stated to positively prevent spurting. The pump—operating in original 400-lb. and 100-lb. drums or in bucket-type containers—supplies industrial material through hoses for spray gun, pole gun or extrusion gun application. Extra high volume pumps operate within a broad air pressure range (from 20 to 175 PSI), can be powered by air compressors with either large or small output capacities.

only 8½ lb. by careful design. Standard features include top grade pre-formed flexible aircraft cable, stainless steel fittings and springs, plus oiled-for-life bearings. The handle is reversible and acts as a "safety valve" to protect the user. If a rigging must be left overnight, the handle can be removed in 10 seconds, leaving the setup tamperproof. A unique combination of three swivel hooks and a built-in pulley block allows work to be done around corners, and as close as 10 in. at the ¾ ton rating.

23

Portable Winch Hoist

A new 1½ ton alloy winch-hoist, announced by The Lug All Co., Wynnewood, Penn., is claimed to offer many



Lug-All Winch Hoist

new and useful features. With a 30 to 1 power ratio and fully tested to a 100% overload, weight of the hoist is held to

24

30 Ft. Portable Air Compressor

A new 30 ft. capacity portable air compressor has been announced by Worthington Pump and Machinery Corporation, Harrison, N.J. This two-staged, air-cooled, compressor has a maximum operating pressure of 150 lb. It is equipped with: ASME air receiver, oil bath air cleaners, protective V-belt guard. Features include: circumferential cooling fins, tube and fin type air-cooled intercooler, positive by-pass unloader holds inlet valve open during idling period. Worthington Feather Valve, separate, close-grained cast iron honed cylinders, full floating wrist pins, oil dippers for controlled lubrication, aluminum low pressure piston and cast iron high pressure piston of equal weight for proper balance.



Graco Mogul-Type Powerflo Pump

MANUFACTURERS' LITERATURE

25

Ice Control

A brief, "Calcium Chloride for Ice Control," issued by Calcium Chloride Association, 909 Ring Building, Washington 6, D. C., describes selection of abrasives, and procedures for most efficient treatment, storage, and handling of abrasives. This information is based on experiences of nationally known engineers who have served on ARBA and HRB committees devoted to ice control problems and practices.

26

Equipment Lubricating Systems

A new catalog of particular interest to contractors has been issued by Lincoln

Engineering Co., St. Louis, Mo. It features the latest in heavy duty lubricating systems for construction equipment. Descriptions and drawings are given of four models of Lincoln standard lubrarians for contractors' field service. The standard heavy duty "21" series drum pumps are illustrated and described. A page is devoted to illustrations and descriptions of units for self-assembled lubrication rigs. Another page is devoted to hose reels, spring powered and manually operated, and to accessories and grease fittings.

27

Peladow Production Increased

Success with highway ice and dust control field trials and increased shortages of conventional forms of calcium chloride have prompted the Dow Chemical Co., Midland, Mich., to step up production of Peladow Calcium Chloride 94.96% at the company's Ludington, Mich., plant. Offered in limited quantities for the past two seasons, the high test

anhydrous pellets are now being priced competitively f.o.b. Ludington with Dowflake, the company's established calcium chloride product.

28

Timber for Building

A new pictorial bulletin, "Timber for Military, Commercial and Industrial Buildings," published by Timber Engineering Co., Washington, D. C., is devoted to outstanding examples of structures built of timber in all parts of the United States. It presents the advanced uses to which the Teco connector system of timber construction, using the wedge-fitting split-ring connectors and Trip-L-Grip framing anchors, have been put in many types of building. The booklet also treats glued-laminated timber construction and the gracefully decorative lamella construction. Augmenting a photographic record of impressive building projects covering a wide field of design and use, a series of drawings depict the practical applications of the Teco connector system.

29

Core Drills

Joy Manufacturing Co., Oliver Bldg., Pittsburgh, Pa., has recently released Bulletin D-28, a new bulletin describing in detail the versatile joy 22 HD heavy-duty diamond core drill. The bulletin offers information and complete specifications on the 22-HD, a 2000-ft. capacity drill driven by gasoline, electric, or compressed air and mounted on truck, steel skids, or underground column.

30

Ward-Leonard Electric Unit

The design and operating features of the Marion Type 93-M Ward-Leonard electric machine are described in Bulletin No. 401 issued by Marion Power Shovel Co., Marion, O. Built for heavy-duty service on long-term jobs in quarrying, metal mining, coal and construction, this machine incorporates Marion Ward-Leonard electric controls for all major operating motions, including hoisting, swinging, propelling and crowding.

31

Anti-Corrosion Coating

Corrosion resistance superior to conventional zinc coatings with cost savings in claimed for Zincilate, the one-coat, self-protecting, anti-corrosion coating described in a new 8-page illustrated technical bulletin published by Industrial Metal Protectives, Inc., Dayton, O. The bulletin presents case histories on outstanding companies and typical applications showing Zincilate's exceptional resistance to severe abrasive and corrosive conditions; complete specifications for the two Zincilate formulations, and data on surface preparation and methods of application.

32

Depth Hardening Steel

Simple procedure for real gradient depth hardening of large or small machine parts, cutting and impact tools, wire, hand tools, engraved stamping dies, etc., by the Wilson Process is described and illustrated in the new Bulletin No. 13 now being distributed by Wilson Carbon Co., Inc., 60 East 42nd St., New York 17, N. Y.



WAUSAU IRON WORKS

The WAUSAU IRON WORKS has concentrated its full efforts and engineering skill toward one objective - BUILDING THE BEST SNOW PLOWS AND SNOW WINGS IN THE WORLD.

Today, as in the days when WAUSAU and its dealers helped far-seeing Public Officials pioneer the idea of snow removal, the name WAUSAU on a snow plow is the symbol of quality backed by these proven features of superiority in construction and design:

• MOLDBOARDS

- Alloy steel for strength.
- Rolled smooth for less resistance.
- Adjustable for pitch.
- Spring mounted deflectors.
- Adjustable and oscillating shoes.
- Level Lift.

• HITCH

- Tailored to truck to distribute weight and stress.
- 4 or 6 point push using Wausau's exclusive toggle.
- Chafing for side thrust.
- Vee and One-way interchangeable.

A size and shape for every need on every type of motive power from light weight speed plows to the Largest Heavy Duty plows which use plate deck plus riveted and welded construction with truck frame chafing.

Write for details

WAUSAU IRON WORKS

Pioneer Snow Plow Builders

WAUSAU, WISCONSIN

Sold and Serviced By Leading Equipment Distributors

4 cu. yd. Power Shovel

A new 12-page bulletin announced by Marion Power Shovel Co., Marion, O., gives a complete design and performance story on the Marion Type 111-M machine. This machine, equipped with diesel power, electric swing and Marion air control, is available for service as a shovel, dragline, clamshell, crane or long range shovel. The 111-M carries a 4 cu. yd. dipper as a standard shovel and a 3½ cu. yd. dipper as a long range shovel. Dragline bucket capacity varies from 3 to 5 cu. yd., depending on the length of the boom.

Electrode Guide

A new 56-page electrode guide covering all P&H welding electrodes is being distributed by Harnischfeger Corporation, Welding Division, Milwaukee, Wis., of pocket size for easy reference, the guide has page tabs marking the various classifications of electrodes. A helpful feature is the 2-page comparative chart which lists corresponding types of electrodes. The booklet also includes a description of each electrode, typical applications and the sizes which are available.

Diesel Engines and Power Units

A new folder describing its line of diesel engines and power units is available from the International Harvester Co., Chicago, Ill.

Portable Boiler Units

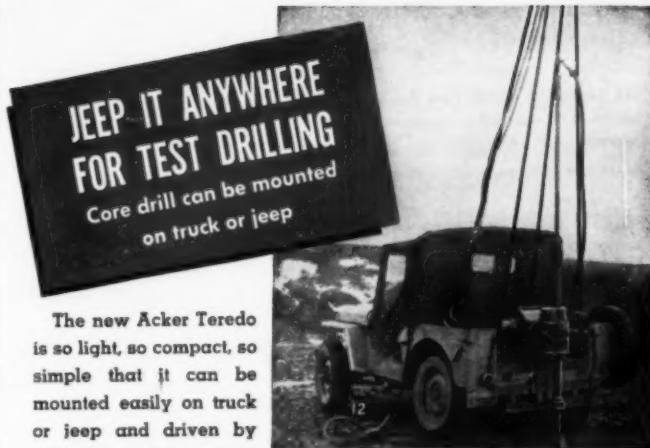
A 4-page data sheet covering its special portable boiler units has been issued by Wm. Bros Boiler & Mfg. Co., Minneapolis, Minn. These units include an electric powered, oil fired unit; an electric powered, manufactured or natural gas fired unit; a unit adapted to burn bunker "C" oil; a completely automatic electric powered, oil fired unit; an automatic unit fitted with rail type wheels for use on trackage. Detailed specifications and data are given for all models.

Portable Steam Boilers

A new 4-page folder describing its line of portable steam boilers has been published by Wm. Bros Boiler & Mfg. Co., Minneapolis, Minn. Three models, 26, 41 and 55 generated horsepower, are available in four body types: semi-trailer with front rubber-tired caster wheel or adjustable stiff leg, skid chassis frame mounted, or in truck mounted combination with a Bros circulator and heater.

Concentric Action Vibrating Screens

Link-Belt "CA" concentric action vibrating screens for medium and heavy duty service, accurate sizing, thorough rinsing and rapid dewatering of a wide range of materials, ranging from ashes to zinc ore, are illustrated, described, tabulated in a new 12-page book No. 2354, available from Link-Belt Co., Chicago, Ill. Detailed dimensions, weights, and other engineering layout data are given, including a page on how to select the right size of screen for handling a given capacity of material per hour over square openings of up to 3 in.



The new Acker Teredo is so light, so compact, so simple that it can be mounted easily on truck or jeep and driven by separate motor or power take-off. Small as it is, the Teredo is a high capacity, fast-operating unit capable of extracting cores up to 2-3/16" in diameter and of drilling to depths of 600 feet.

Send for bulletin 3-A-RS.

8-A

ACKER DRILL COMPANY INC.

Scranton 3, Penn.

Cut Costs!
with **ONAN** portable
ELECTRIC PLANTS

Take 'em Anywhere!

MODEL 3CK
3,000 watts A.C.
5,000 watts D.C.
with carrying frame
or dolly-mounted

Increase your profits by using fast-working, cost-cutting electric tools on every job, even where highline power is not available. Lightweight, sturdy, Onan engine-driven electric plants supply instantly-available power anywhere for lights, drills, saws, pipe-

threaders, planers, spades, tampers, repair-shop tools and other motor-driven equipment. Carry 'em, wheel 'em, or truck 'em right to the spot and plug in for all the power you need. Equipped with carrying handles or dolly-mounted.

Lightweight Air-Cooled Models: A.C.—400 to 3,000 watts. D.C.—750 to 5,000 watts. Heavy-duty models to 35,000 watts.

Write for Free Folder!

D. W. ONAN & SONS, INC.

2828 University Ave. S.E., Minneapolis, Minnesota



VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air compressors.

Send for NEW Vulcan Illustrated CATALOG today.



TOOLS — THE WORLD OVER —
NOTED FOR QUALITY AND DURABILITY

VULCAN TOOL MFG. CO.
QUINCY MASS.

CUT YOUR SWEEPING COSTS 75%
Wilshire POWER SWEEPER

Picks up everything
from cigarette butts to
pop bottles in one easy
operation!

Write today for
dealer nearest you and
FREE on-Your-Job
DEMONSTRATION.

For dealer nearest
you, write Dept. D-1

Wilshire
POWER SWEEPER CO.
124 W. Quincy Avenue Drive
BIRMINGHAM 6, CALIF.



BLADES for Snow and Ice Removal

FOR ALL MAKES AND
MODELS OF SNOW PLOWS

Made of specially developed
steel to withstand severe
service conditions.

Various widths, lengths, thicknesses—flat or curved—standard or special-punched ready
to fit your machine.

SHUNK ICE BLADE

Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow blades or maintenance units. Write for Bulletin and name of nearest Distributor.



Shunk

MANUFACTURING
COMPANY

ESTABLISHED 1854
BUCKEY, OHIO.

WITH THE MANUFACTURERS & DISTRIBUTORS

Appointed Advertising Manager. Bertram V. Jones has been appointed advertising manager of Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., to succeed Julius S. Holl, deceased. John F. Kelly will continue in the capacity of assistant advertising manager. Mr. Jones joined the Link-Belt advertising department in Chicago in January, 1923, after having done advertising work for several other companies. He has since then handled production, creative direct mail and catalog work, and for a period of seven years served as advertising manager for Link-Belt Speeder Corporation, a subsidiary company building shovel-cranes. He was appointed assistant advertising manager of Link-Belt Co. in 1949 and became executive assistant advertising manager on July 1, 1950.



B. V. Jones

Ed Galvin Joins Buda. E. R. Galvin has been appointed merchandise manager of The Buda Co., Harvey, Ill. Ed Galvin has long been a prominent figure in construction circles, having served successively as general sales manager of Caterpillar Tractor Co., R. G. LeTourneau, Inc. and LaPlant-Choate Manufacturing Co., in which positions he gained a wide knowledge of construction practices with both track type and rubber-tired equipment. As merchandise manager he will supervise retail sales through the Buda distributing organization. His headquarters will be in Harvey.

Julius S. Holl Is Dead. Julius S. Holl, advertising manager of Link-Belt Co. for almost 40 years, died recently after a prolonged illness. Mr. Holl was born in Philadelphia in 1886 and entered the employ of Link-Belt Co. at a subsidiary company, The J. M. Dodge Co., Philadelphia, in 1905, as stenographer and clerk. He was subsequently transferred to the parent company's Philadelphia plant stenographic department and soon became drafting room clerk. He later joined the Link-Belt advertising department and on March 1, 1911, was made advertising manager at Philadelphia, with instructions to "move our small advertising department to Chicago headquarters, where he (President Charles Piez) could personally supervise it." The Link-Belt advertising department of today consists of about 40 people and uses over 200 business and industrial publications to reach the trade. Mr. Holl has

done much through the years to popularize Link-Belt Company and its products, and is well known throughout the advertising profession.

New Dietz Co. President.

For the fourth consecutive generation, a son has followed his father to the presidency in the 110-year-old firm of R. E. Dietz, Syracuse, N. Y. Robert E. Dietz has been made chairman of the board and his son Gerry J. Dietz has been promoted to presidency of the company. R. E. Dietz was elected president in 1936. Gerry J. Dietz has served in the R. E. Dietz Co. in various capacities for the past 13 years and worked in the plant summers, during his student days at Yale.



G. J. Dietz

Worthington Names Chief Engineer. Louis G. Hilkemeir has been appointed chief engineer of the Construction Equipment Division at Dunellen, N. Y., of Worthington Pump and Machinery Corporation. He formerly was a construction machinery engineer with the Chain Belt Co., Milwaukee, Wis.

Forms Construction Equipment Division. Western Machinery and Engine Co., 5075 Manchester Ave., St. Louis, Mo., and 125 E. McCord St., Centralia, Ill., have announced the formation of their Construction Equipment Division, to handle the sales and service of contractors and industrial equipment and supplies in Eastern Missouri, Southern Illinois, and Western Kentucky. John E. Heintz, long identified with the construction industry, is manager of the new division.

McCoy Promoted

by Caterpillar, William E. McCoy of Camden, N. J., heretofore district representative in the Eastern Division, has been named assistant sales manager of the Central Division of Caterpillar Tractor Co., Peoria, Ill. Since the war, he served one year with the War Production Board and three years in the navy. McCoy has been a district representative of Caterpillar in the Eastern Division. He joined the company in 1939 as a college graduate trainee. He succeeds Herman Eberling who recently went on active duty as a captain in the U. S. Corps of Engineers.



Wm. E. McCoy

New Riddell Distributor. Standard Equipment and Supply Co., Little Rock, Ark., has been appointed distributor for the Wareo motor grader and Hercules road roller of W. A. Riddell Corp., Bucyrus, O.

New Euclid Service Manager. John E. Ehler, formerly in the sales department of The Euclid Road Machinery Co., Cleveland, O., has been appointed manager of service and parts. He succeeds J. M. Fairbanks who has been promoted to the post of assistant factory manager.

WE'RE STILL ABLE TO SUPPLY YOU!



BUY
DIRECT
AND SAVE
PHONE
TODAY!
WRITE
TODAY!

911 Ferry St.
Oakland, Cal.

TEMPLEBAR
6-0552

This is Our Sixth Shipload of Hard-to-Get Gov't Surplus
CONSTRUCTION EQUIPMENT

CRANES - TRACTORS - FORK LIFTS - COMPRESSORS - GENERATOR SETS
(DIESEL & GAS)
DITCHERS - MOTOR PATROLS - ROCK CRUSHERS - TOURNAPULLS
SHOVEL FRONTS - CLAMSHELL BUCKETS - DRAGLINE BUCKETS
DOZER BLADES - SHEEP'S FOOT TAMPERS

TRUCK PARTS

GMC - INTERNATIONAL - DODGE - AUTOCAR - JEEP - DIAMOND "T"

DUAL DRIVE UNITS - TRUCK MOTORS (Diesel and Gas)
TRANSMISSIONS - TRANSFER CASES

REAR DRIVE UNITS - FRONT DRIVE UNITS - HUBS - DRUMS - AXLES
PILLOW BLOCKS - DRIVE LINES - POWER TAKE-OFFS

CALL OR WRITE US FOR ALL YOUR TRUCK NEEDS

←NOW, TWO CONVENIENT LOCATIONS→

DEAN BROS.

BUY-RITE, Inc.
TRUCKS and EQUIPMENT

3645 Jensen
Drive
Houston, Tex.

•
BLACKSTONE
6641

We do a Nation-Wide business in
STEEL SHEET PILING

New & Used Rented & Sold
143 psc. 40x50 ft. Inland 122-Chicago
143 psc. 40x40 ft. Cars. M116-Missouri
305 psc. 35-15 ft. Bush. SP4-Alabama
208 psc. 30-25 ft. Cars. M112-Minnesota
67 psc. 20 ft. Bush. AP3-Buffalo, N.Y.
Other lengths and sections at various locations
All sizes Vulcan & McKersie Pile Hammers
& Extractors for Rent and Sale—Shop Rebuilt
Regardless of location of your job, wire or write
MISSISSIPPI VALLEY EQUIPMENT CO.
515 Locust St., St. Louis, Mo.
"WE BUY STEEL PILING FOR CASH"

AUGERS
of every description

TWISTED
STEEL
1-1/4" to 3
DIAMETERS



SPIRAL
WELD
TUBULAR
1-1/2" to 54"
DIAMETERS

Shanks and Sockets
to meet your specifications

THE SALEM TOOL CO.
797 Ellsworth Ave., Salem, Ohio

**NOW'S THE TIME
TO BUY!**

TRACTORS

Caterpillar "RD-9" Used Tractor w/LeTourneau
Dozer
International TD-14 Diesel Tractor w/LeTourneau
Dozer
Allis-Chalmers HD-7 Diesel Tractor w/Dozer
Cater "40-D" Diesel Tractor w/Hydraulic Dozer
Cater "40-D" Diesel Tractor w/Hydraulic Dozer
Hough "HL" Piledriver, 1-1/2 yd. Bucket
M. M. "UTIL" Industrial Tractor w/LeLii Shovelhoe
LePlant-Chester "C-64" New 4-yd. Scraper. Save
\$100.00
Honka "707" Maintainer, 10' Blade, Hydraulic at
Air Force Feed Loader, used

AIR COMPRESSORS

Davey "100" Portable Compressor, 2-wheel, pneu-
matic, sale-rent
Cleveland DR-30 Wagon Drill, sale or rent

MIXERS AND PAVERS

Jaeger "G-B" used 1-bag mixer, pneumatic
CNC "16-6" used 1-bag Mixer, pneumatic
Rex "14-B" used 1-bag Mixer, pneumatic
Rex "22-E" used Paver, big Drum. Ready to pave

CRANES AND SHOVELS

Link-Belt Speeder "18-40" 1/2 yd. Dragline, Rental
or Sale
Eric 1/2 yd. New Clamshell Bucket
Eric 1/2 yd. New Clamshell Bucket
Wellman "12M" New 1/2 yd. Clamshell Bucket

**EIGHMY
EQUIPMENT COMPANY
ROCKFORD, ILLINOIS**

FOR SALE

New Johnson low bin trolley batcher, has
maximum 30 ton cap. with scale on rubber
tires with tow bar dumps, directly into
65, 115 and 165 mixer skip; has 4 bins.
1—like new 3 1/2 yd. Ransome Transit mixer
mounted on F.W.D. Truck.

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TRUCKS WANTED

Highest dollar value paid for new
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FOR SALE—SACRIFICE

Allis-Chalmers HD-10 w/angle dozer. \$7,500.00.
Excellent Working Condition.

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**WE BUY OR SELL
All Types of**

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New or Used—Hyster D8N-D7N—
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Now Available!

1—445' G.D.-WBH Compressor w G.M. Diesel.....	\$ 4,250.00
1—315' G.D. Portable Compressor—Gas.....	\$ 1,000.00
1—400 KW Enterprise Dual Fuel Gen. Unit.....	\$33,500.00
3—100 KW Superior Diesel Generating Units.....	\$ 4,500.00 ea.
2—12 ton Davenport type Diesel Electric Loco.....	\$ 9,000.00 ea.
1—D8 Caterpillar Tractor w. d.d. p.c.u. & dozer.....	\$ 5,500.00
1—D8 Caterpillar Tractor w. d.d. p.c.u. & dozer.....	\$ 8,500.00
3—#12 Caterpillar Motor Patrols.....	\$6,000.00 to \$7,000.00 ea.
4—Super C Tournapulls.....	\$ 7,000.00 ea.
1—Mess Hall Complete—300 man.....	Price on application
1—4000 gal. Dart Sprinkler Truck—Diesel.....	\$ 9,000.00
6—4 cu. yd. Gar-bro #4123A Concrete Buckets.....	\$ 1,500.00 ea.
8—26.7 cu. yd. Southwest Bottom Dump Trailers w 200 HP Peterbilt Diesel Tractors.....	\$16,500.00 ea.

Above equipment is located at Republican City, Nebraska

Following equipment located on the West Coast:

1—5BV Euclid Loader—New 1948.....	\$16,000.00
2—4500 gal. Western Sprinkler Trucks—Diesel.....	\$ 7,500.00 ea.
3—Mod. W LeTourneau Carryalls.....	\$ 7,500.00 ea.
1—Davenport Rooter (11,000#).....	\$ 1,000.00
1—34E Ransome Dual Drum Paver, Diesel.....	\$ 8,250.00
4—4 cu. yd. Dumpcrete Bodies.....	\$ 1,500.00 ea.
1—7 ton Whitcomb Gas Locomotive, 36" gauge.....	\$ 450.00
2—D17000 Caterpillar Power Units.....	\$ 5,600.00 ea.
1—2 cu. yd. Owens Type DX Clamshell Bucket.....	\$ 2,000.00
1—10B3 McKiernan Terry Pile Hammer.....	\$ 2,700.00
3—#12 Caterpillar Motor Patrols.....	\$ 6,750.00 ea.
1—13 cu. yd. Mod. 55FDT Euclid Bottom Dump.....	\$15,500.00
20—20 cu. yd. Western End Dump Rock Trucks—Diesel	\$ 5,000.00 ea.
4—26.7 cu. yd. Southwest Bottom Dump Trailers w 200 HP Peterbilt Diesel Tractors.....	\$16,500.00 ea.

All offerings are subject to prior sale

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For complete list of equipment available for sale, contact either:

GUY F. ATKINSON COMPANY

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CUMMINS DIESEL ENGINES

War Surplus!
Only 46 Units Left

Model HB600—4 cyl. 6 1/2" Bore, 6" Stroke,
672 cu. in. displacement. 150 brake H. P.
@ 1800 R.P.M. Fully equipped as used in
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Call or write

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Kinny Bituminous Distributor 800 gal. cap.
22 ft. Spray bars—Two way Controls—cab
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WRITE

WARWICK BROTHERS
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P. O. DANBURY
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FOR SALE

Lorain 80 Shovel, Ser. 9656, 34" Treads,
30 ft. boom, 25 ft. dipper stick, 1 1/2 cu. yd.
bucket. "Caterpillar" D13000 Diesel engine.
1940 model. Good running condition.
Very reasonable. Located in Vermont.

Lima Model 750 1 1/4 yd. Shovel and 75' crane
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180 L.F. Box Sewer Forms

9 Units 20 ft. long with Traveler for
Each Unit. 7 ft x 7 ft. Can Make
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Units Built By Lancaster Iron Works.

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Immediately available, Granby,
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I—1500 Bbl. C.S. Johnson Cement
Silo.
I—Model 200 Colby Gantry Crane,
electric.

All Subject to Prior Sale

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1 Cedarapids 40x24 secondary roll crusher unit including 4x12 DD vibrating screen, conveyors, etc., semi-trailer steel truck with tandem rear axle, air brakes, powered by Murphy Diesel ME6, excellent condition, ready for operation. Attractive price.

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Late type Cummer asphalt plant—complete with dryer—hot and cold elevator—dust elevator—oil burner—vibrating screen—4 compartment aggregate bin—dial scales—2 ton pugmill—Multicone dust collector. All motor driven. Located New York metropolitan area.

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8—KBRLL Dump Trucks
10—Tank Trailers
2—Mixer Trucks

for immediate delivery

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SALES COMPANY

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FOR SALE
READY-MIX
CONCRETE TRUCKS

International KBR-11, Single Dual Trucks, Mounted with 3 Cu. Yd. Jaeger High Discharge Mixers, 2-1/2 years old.

One Used 60-KW Cummins Diesel Electric Generator.

For further information, call
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HOUSTON SHELL & CONCRETE CO.
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SEE THESE BARGAINS
AT CLINTON, INDIANA
IMMEDIATELY AVAILABLE

Bucyrus-Erie 50-B Diesel shovel.
International TD-18, Bucyrus-Erie dozer.
Allis-Chalmers HD-19; DDPUC; straight dozer.
Escr 3 c.y. coal dipper (new).
McCarthy Hi-Wall drill.
Lincoln 300 amp. gas welder.
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Glenn Roberts 300 amp. trans. welder.
Glenn Roberts 70-420 amp. trans. welder.
Lorain Model 820 shovel, 2 c.y.
American pulverizer coal crusher.

CHICAGO STOCK

25 K.W. Diesel generator, 220/440 A.C., rebuilt
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R.P.B. breaker on Ford with 210 Sullivan.
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1—Adams Model 105 pull-type grader on
pneumatic tires, 10' blade, powered by a Wisconsin
air-cooled engine, good
condition.
1—Galion Model C Motor Grader, single
rear axle, gasoline-engine powered, fair
condition.
1—Scoopmobile on rubber tires, good
condition.
1—Shovel attachment for Insley Model
K-12, new condition.
1—Shovel attachment for Byers 1/2-yard
machine, good condition.
2—Model BB 2 1/2 h.p. Gladden air-cooled
engines.
1—New consolidated 25 K.W., 440 volt
A.C. generating plant, powered by International
UD-9 diesel engine, skid mounted with starter and switch board,
price f.o.b. Minneapolis, Minn. \$1,975.00
1—New Rogers 10-ton Tag-Along Trailer
complete with vacuum brakes and truck
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ROSHOLT EQUIPMENT CO.
3138 Snelling Avenue
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FOR SALE

N.W. Model 6-1 1/2 yd. N.W. Model 80-2 yd. Lima
1291 Cummins engine—3 Cu.Yd. Shovel—3/4 yd.
concrete mixer—Excavators—Cranes—
Fork Lifts—C. Y. Tunnagulls—Euclid Trucks—Loco-
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Rutan Kilmer Diesel 1750-1800-1700 others.
250 KW Diesel Generator—new.
48" Gyroshaver Crusher—Gyratory Crushers—Heli
Crusher, Cone Crushers—Jaw Crushers—60" x 42"—
28" x 42", R.B.—24" x 36"—20" x 36"—18" x 36"—
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Red Mills—Ball Mills—Feeders—Classifiers—Tippers
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Stanley B. Troyer
Theatre Building Crosby, Minnesota

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Galion Model 12, 100-H.P.
Caterpillar 12 with plow and wing.
Huber Maintainer.
Caterpillar No. 11.

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Galion 3-5 ton mortar.
Galion 3-5 ton tandem.
Austin-Western 10-ton.
Huber 5-ton.
CM&E 3-ton.

SCRAPERS

1 Gar Wood Model 400 hydraulic scraper.
1 LeTourneau Model F, 4-18 yard capacity.

CRAWLER TRACTORS

1 Allis-Chalmers Model L with DD PCU.
1 DD PCU for Allis-Chalmers Model L.
1 Model AD Crawler with hydraulic angle dozer.
1 Oliver 800H with 10' blade hydraulic angle dozer.
1 Oliver 125 with 10' blade.
D7 with dozer, Serial No. 3T14056.
1 Do Traxcavator, Serial No. SF1702.
D8 with dozer, Serial No. 3T14052-SP.
1 D9 with dozer, Serial No. 3T22280.
1 Oliver MG with loader, Serial No. 44GA410.

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Case 51 (New condition).
Case Model D1 with Lo-14B Shovelhoe.
Ford with front end loader.

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Schramm 60 cu. ft. portable.
Jaeger 75 cu. ft. portable.
Jaeger 125 cu. ft. portable.
Jaeger 365 diesel on rubber.
Jaeger 500 cu. ft. portable.
Jaeger 600 cu. ft. portable.
Jaeger 250 cu. ft. portable.
Jaeger 210 cu. ft. portable.

MIXERS

Jaeger 3 1/2 cu. ft., nonlift.
Jaeger 3 1/2 cu. ft., nonlift.
Ransome 3 1/2 cu. ft.
Rex 27 cu. ft. paver.

SHOVELS

Schield Bantam 1/2 cu. yd. shovel and trenchhoe on
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Link-Belt Spreader 1 cu. yd. shovel, crane, trenchhoe.
Lima 1 1/2 cu. yd. shovel and crane.
Lima 301 5 cu. yd. shovel and crane.

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Thor paving breakers—all models.
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Pettibone Mulliken 5/4-yd. type C drag bucket.
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Jaeger 1 1/2" to 6" portable.

SNOW PLOWS

Frink Model 20RTB 8-ft. reversible blade plow for
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Wausau 200RB reversible blade plow for 2 to 3-ton
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30 ton Orion diesel locomotive crane
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800 CFM Chic. Pasu. air compressors
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FOR RENT
WORLD'S LARGEST CRANE ON RUBBER
New LORAIN MOTO CRANE

MODEL MC 820
45 Ton Lifting Capacity
125 foot boom—25 foot rib
BUCKS COUNTY CONSTRUCTION CO.
Pendel, Pa.

CLEARING HOUSE

DIRT MOVING
& QUARRY EQUIPMENT

TD-24, used 400 hrs., latest model, only 2 months old, with Bucyrus-Erie dozer & winch, Ser. #TDE-2504. Price \$22,750.00

TD-40, tractor w/ hydraulic Gyr Wood dozer in working condition & w/ pulley. Price \$2,500.00

Adams SI Diesel motor patrol w/ 10' moldboard. In good condition. \$2,250.00

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Vibrating rip-rap screen, Cedarapids 4' x 9' w/ drives, Model DDHD. Price \$3,200.00

Jaw crusher, Cedarapids 9' x 24' portable w/ folding elevator. \$2,500.00

Diamond vibrating 4 deck screen. Just statistically & dynamically balanced w/ drive, 4 x 10'. Price \$3,750.00

L-180 IHC dump truck, 150" wheel base, 10 ton capacity w/ 4 yd. hydraulic Perfection dump box & Eaton 2-speed axle. Price \$11,500.00

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EVANS HEATERS
"ALL USE PORTABLE"
HEATING UNIT

EXCELLENT FOR:

Sub Zero Weather
Construction Work of All Kinds
Keeping Trucks and Equipment Warm
All Farm Uses

Complete for installation with directions, gas tank, brackets, etc.

\$33.50

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Blow-Knox 700 bbl. portable bulk bin, used very little.
Blow-Knox high boy, 3-yd. mixer for 4½-yd. agitator, mounted on GMC. One year old.
3-yd. Jaeger horizontal mixer, mounted on 3-ton chassis. Good condition.
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2-yd. Rex mixer, 3-yd. agitator, mounted on 2½-ton Federal.
New Holland 18x22 roll crusher, needs shells. Cheap.

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FOR SALE Hanson Model 30 Dragline with Hendrix ½ yd. perforated bucket. This machine has operated less than 1000 hours, is in good condition and can be purchased at a sacrifice price.

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1—Used Koehring Model 27E-2A Paver, Serial No. 16441, powered with Waukesha gasoline engine. This paver is in first class condition and ready to go to work. This machine is F.O.B. cars Holdrege, Neb. brusker.

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1—Used D-9 Caterpillar Tractor, Serial No. 88-9579, complete with LeTourneau Model 188 Double Drum Power Control Unit. This tractor has been completely overhauled with all new bearings in transmission and final drives, new sprockets, rollers, and roll assembly.

1—Slightly Used Minneapolis-Moline Model RTI Industrial Tractor No. T-0054800145. Used less than 2 months.

1—Used International Model T-40 Crawler tractor, gasoline engine driven, complete with side beam for pipeline work. Serial No. C7651.

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MACH. CO.

901 South 40th St.
OMAHA, NEBRASKA

FOR SALE

Three power units, Continental engines, Model #330, 75 h.p.; one new, unused; one factory rebuilt, unused; one used, excellent condition.

Two 30-ft. 12-in. channel.

Heavy-duty Carter centrifugal pumps, on rubber tired trailers.

10x27-16 Ply Nylon Tires \$130.00 Each. Suitable for Earth moving.

STEEL BAR CHANNEL

2 ton, 14-in. by ½-in. pickled and oiled.

NEW 100' ROLLERIZED USED WATER PIPE

50' NEW RECIPROCATING TYPE SHALLOW

WELL PUMPS

300 gal. per minute capacity, ½ h.p., 110 volt motor.

A. MARCHESI COMPANY

1737 N. 30th St., Milwaukee 8, Wis.
Telephone Div. 2-8245

FOR SALE

Speeder 85 Dragline
Sargent 34 Dragline
Sargent Junior Dragline
Sargent Model 12 Dragline and Shovel

Koehring 304 Dragline

Barber Greene Ditcher

New ½ yd. Sargent Diesel Dragline

line

SARGENT
ENGINEERING, INC.

FORT DODGE, IOWA

FOR SALE

2—H.D. 19, A.C. Tractors with DD PCU and push plates.

2—D-7 Tractors with Cat Bulldozer and DD PCU.

1—D-8 Tractor with DD PCU.

1—1948 Auto Car Tractor Tandem Axle, 10:00-22 Tires.

All equipment is good working condition, and may be seen working near Howies, Nebraska.

Ray Millis, Contractor
418 Keeling Bldg.

OMAHA - - - NEBRASKA

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Model 160, Serial #CCZ-215, approx. 450' 6" Pipe Angle & Ells and Spars. Parts. Excellent Condition.....\$35,500.00

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FOR SALE: Four Caterpillar BW10s and Caterpillar Scrapers 1948 and 1949 models. Excellent Condition. \$14,000.00 each.

Northwest Crane Model 25 GMC Diesel, ½ yd. dragline and clamshell. '49 Model. \$19,000.00.

1948 Allis-Chalmers Model HD 18 with Gator Doser. \$6500.00.

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CONTACT PH: 4-5110
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FOR SALE

1—B & W coal pulverizer

1—70 HP Marine type diesel engine

1—Vacuum pump

1—Deck hoist

Tug boat

Electric motors AC

Switchboard panels for plant operation

Link Belt pan conveyor 36' x 22' centers

1—10' x 150' kiln with new liners

Fuller clinker cooling equipment for 10' kiln

5' x 22' tube mills

Chain and belt elevators

1—Sand blasting machine

1—Small Logan lathe

2—Clam shell buckets

OLIE E. LAWRENCE

P. O. BOX 688
QUINCY, MICHIGAN

FOR SALE

Lorain 820 Shovel, Marion 362 Combination, 80-D Northwest Shovel, Northwest Model 8 Backhoe, Buckeye ½ Yd. Shovel, Lorain Model 80 1½ Yd. Shovel, Lorain Model 41 Shovel, Osgood Model 200 ½ Yd. Comb., Bucyrus Models 15-B and 22-B Cranes. 8 D-8 dozers in 2U series, 5 HD18's dozers, International TD24, TD18, KTD 8, TDS dozers. Parsons 810 Diesel Tractor, Buckeye C-15, C-10, C-20, 401, 410, 110, 95, P & H Trencher Model 1030, Austin 105, Model 16-8 Truck mounted, Garwood 17 Yds. Model 515 Scraper, Bucyrus-Erie 18 Yd. Model 512 Scraper, Bucyrus-Erie 8 to 10 Yd. Model 8-67 Scraper, Diesel heavy tandem Warco Motor Grader, International 1-8 Bulldozer with rubber tires, Nove Paving Breaker mounted on White Truck, Clamshell and dragline Bucket—all sizes, Northwest Shovel Front, Models 2, 25, 6 and 80-D, Marion 362 Shovel Front, Buckeye ½ Yd. Shovel Front, Model 70, Link Belt Model 16-40 Front, Lima 1201, 802, Manitowoc Shovel Front Models 2500 Std. and Model 3000 Std., Lorain Shovel Front Model 80 ½ Yd. P & H Shovel Front Model 400, Osgood 1 Yd. Front, Lorain 820 Shovel Front, 10-DW10's with LaPlant Choute Scraper, 8 LeTourneau Super C Tournapull, 8 Woodridge Terra Cobra Prime Movers, Backhoe Attachments for P & H 255, Osgood Model 200, Inslay Model K-12 and Bay City Model 48, Fairleads for Osgood 200, Inslay K-12 and Bucyrus-Erie B22, Crane Hoists for Northwest No. 6, Inslay, Osgood and Lorain No. 820 and 880.

AIR COMPRESSOR RENTAL CO.
19615 Nottingham Road
Kenmore 1-8000 Cleveland, Ohio

FOR SALE

WOOLDRIDGE TERRA-COBRA SCRAPER

Model TA—Scraper-Tractor Unit
Model WA-3—Control Unit
24-ply Tires—fully equipped

WIRE ROPE

New surpension—240 dia. 6 x 1
High Carbon Galvanized Flow Steel
1,250,000 feet—7100-ft. Reels

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ED LA MOTTE of Noxon, Montana, has for sale: D7 "Caterpillar," late model, A-1 condition, equipped with LeTourneau cable dozer and brush dozer. B821AT International 2 to 4 ton, tag-on trailer, 9.00x20 tires, new. Truck completely overhauled. Patent logging bunks and lumber rolls to 8t. International 6x6, low mileage, A-1 condition equipped with 8.25x20 tires, good as new, single axle logging trailer, 5% ton International pick-up, K-2, good condition. 1934 V-8 Ford bus, good condition, good tires, 11-20 Bissell chain saw. One 2-ft. cutting bar and one 4-ft. cutting bar with new chains. 25-ton dual axle. Beall low boy trailer, equipped with 9.00x15 tires, air brakes and fifth wheel. Also one 300 amp. welder on trailer. Portable.

USED EQUIPMENT FOR SALE

1—2 1/2 cu. yd. ESCO Rock Dumper, Serial No. 5077, with dogleg bail; location, Great Falls, Montana \$2,100
1—Model 21-E Koehring Travelling Concrete Mixer and Paver, Serial No. 12041, powered by Waukesha motor; location, Great Falls, Montana \$1,500
1—Model 1000-1000 Shovel Front combination, Serial No. 4814-2779B, with 1/2 cu. yd. Shovel Front and 1/2 cu. yd. Back Hoe Attachment and 30 ft. Crane Boom; location, Great Falls, Montana \$7,500
1—D-4 Caterpillar Tractor, Serial No. 4791W, with 12 ft. backhoe and other overshot loader; location Great Falls, Montana \$3,500
1—D-8 Caterpillar Tractor, Serial No. 2U-1182, with Caterpillar Model 25 2-drum Power Control Unit and Caterpillar Model 8-S Bulldozer; location, near Newcastle, Wyoming \$6,500
1—D-8 Caterpillar Tractor, Serial No. 1H-3262; location near Newcastle, Wyoming \$5,000
1—Model 25 Parsons Trenching Machine, Serial No. 1284; location near Kalispell, Montana \$2,750

S. BIRCH & SONS
CONSTRUCTION COMPANY
P. O. Box 1926 Phone 3286
GREAT FALLS, MONTANA

LIGHT PLANTS

115 volt 60 cycle A.C. single phase 5 h.p. motor, 1/2 hp. motor, water cooled 14 h.p. 4 cylinder Hercules Engine. Remote Control, complete with boom, 100 ft. of cable, instruments, 150 ft. automatic remote control cable with 100 ft. of cable, 100 ft. of heavy duty wire with reel; housed in metal case with replacement parts and tools. Total value of plant alone is worth \$400. Regular price of unit \$1600. Shipping wt. 1250 lbs. Our price f.o.b. Chicago complete. Also 2 1/2 K. W. Diesel power \$895.00
\$295.00

WRITE FOR ILLUSTRATED FOLDERS
WELLWORTH TRADING CO.
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TRUCK MIXERS

USED—REBUILT

2—JAEGER, 1947, 2 Cu. Yd., High-discharge, Two-Compartment Tank, Separate Dragline Drive (Continental), mounted on Tandem Axle KBF International Trucks, 6.66 to 1 gear ratio, 151" Wheel Base, Trucks purchased new March, 1948. Truck Mileage approx. 35,000. Tires 8.25 all way around, general condition good.
1—JAEGER, 2 Cu. Yd. Hatch Loader, general condition rough.
1—SMITH, 1946, 2 Cu. Yd., High-discharge, Two-Compartment Water Tank, mounted on 1947 Heavy Duty Reo Truck, cleaned and painted.
2—SMITH, 1947, 2 Cu. Yd., High-discharge, Two-Compartment Water Tank, Rebuilt, cleaned and painted.
4—SMITH, 1949, 4 Cu. Yd., Two-Compartment Water Tank, completely rebuilt, sanded and painted; power units completely overhauled.
4—SMITH, 2 Cu. Yd., good operating condition, mounted on Cab-over White WA-122 Trucks, Trucks & Mixers 1941-46 models.

Also have a number of 2 & 3 Yd. REX Mixers, in good operating condition, for sale without trucks.

Complete information furnished upon request.

FUNKHOUSER MACHINERY CO.
2425 Jefferson St. Harrison 4386
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Immediate Delivery

1—Used Buckeye Model 12 ditcher.

1—Used Buckeye Model 70 clipper.

1—"Caterpillar" Model D6 tractor w/ LaPlant-Choate bulldozer & Hyster winch.

1—Garwood 508 scraper.

1—Allis-Chalmers Model HD-10W w/ Buckeye bulldozer & Gar Wood DDCU.

1—Allis-Chalmers W. Patrol.

3 cu. yd. 2 wheel Gar Wood hydraulic scraper. Like new.

LeTourneau 3 1/2 cu. yd. scraper. Very clean.

1—Allis-Chalmers AD3 motor grader.

1—Slightly used 1949 Mack Model E.H. T. demonstrator. Very good discount. Equipped with Tulsa winch, less fifth wheel.

1—Model HD W10 tractor with Gar Wood hydraulic bulldozer.

1—Novo traffic line marker.

1—Gardner-Denver Model 105 portable air compressor.

1—Allis-Chalmers Model "L" w/ Baker hydraulic dozer.

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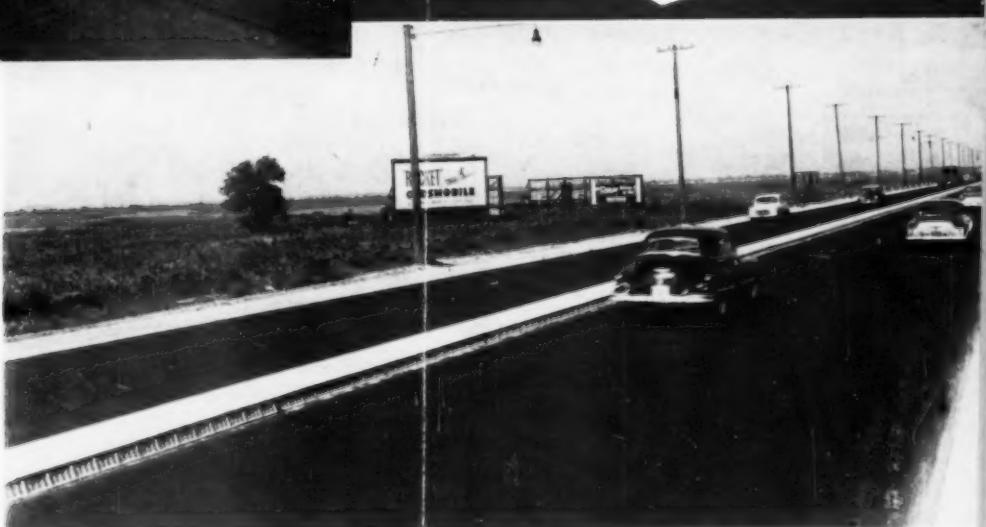
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